Constraining Lexical Phonology: Evidence from English Vowels

April M.S. McMahon

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For Irene Dugan, 1926-1985

I hereby declare that this thesis is of my own composition, and that the work reported herein is my own. Where I have received help, or made use of the work of others, reference is made to this fact at the appropriate place in the text or in the acknowledgments.

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Acknowledgments

Although the declaration on the last page is by no means false, it is perhaps not entirely truthful either. It is true that I am the author of this thesis; and it is also true that this is the first outing for the work reported here (although an article derived from Chapter 3 is also shortly to appear in *Lingua*, under the title "Vowel Shift, Free Rides and Strict Cyclicity"). These facts, however, should not give the impression that all the ideas expressed below (especially the good ones) originated with me. Research does not take place in a vacuum, and inspiration is more often external than internal. There are consequently many people to whom I owe a sincere debt of thanks.

First, I am grateful to the Carnegie Trust for the Universities of Scotland, for financial support: without the Trust, there would be no thesis at all. My colleagues in the Department of Linguistics at Cambridge, especially Peter Matthews, Sarah Hawkins and Francis Nolan, have been helpful and supportive over the last year, and I am similarly grateful to the Master and Fellows of Selwyn College, who have enquired frequently after the progress of this work, and known instinctively when to enquire no further. Many thanks are also due to the members of the Departments of English Language and Linguistics at the University of Edinburgh, especially John Anderson, Fran Colman, Jim Miller and the late Professor Jimmy Thorne, who once had a hunch that looking at Scots might be interesting. However, my most sincere thanks must go to Heinz Giegerich, my supervisor, who taught me phonology, and who, over the last three years, has helped me, advised me, encouraged and supported me, argued with me (and usually been right), and maybe even turned me into a linguist. I can't give him back all the time I've taken up, but I can record here how profoundly grateful I have been, and am, for all of it.

I am also grateful to my family, for personal and emotional support. Thanks to Irene, John and Sarah; and especially to Rob, who has been unfailingly encouraging and tolerant, and who is furthermore the only person I know with whom I could have survived a summer characterised largely by two theses and one word-processor.

Finally, I dedicate this thesis to the memory of my mother, Irene Dugan, who is not here to see the finished product, but who unwittingly prepared me for the trauma of thesis-writing by teaching me, when I was just a little girl, that "every day we learn more and more about less and less until finally we know nothing."

Contents

Abstract

Standard Generative Phonology is inadequate in at least three respects: it is unable to curtail the abstractness of underlying forms and the complexity of derivations in any principled way; the assumption that related dialects share an identical system of underlying representations leads to an inadequate account of dialect variation; and no coherent model for the incorporation of sound changes into the synchronic grammar is proposed. The purpose of this thesis is to demonstrate that a well-constrained model of Lexical Phonology, which is a generative, derivational successor of the Standard Generative model, need not suffer from these inadequacies.

Chapter 1 provides an outline of the development and characteristics of Lexical Phonology and Morphology. In Chapters 2 and 3, the model of Lexical Phonology proposed for English by Halle and Mohanan (1985) is revised: the lexical phonology is limited to two levels; substantially more concrete underlying vowel systems are proposed for RP and General American; and radically revised formulations of certain modern English phonological rules, including the Vowel Shift Rule and j-Insertion, are suggested. These constrained analyses and rules are found to be consistent with internal data, and with external evidence from a number of sources, including dialect differences, diachrony, speech errors and psycholinguistic experiments.

In Chapters 4-6, a third reference accent, Scottish Standard English, is introduced. In Chapter 4, the diachronic development and synchronic characteristics of this accent, and the related Scots dialects, are outlined. Chapters 5 and 6 provide a synchronic and diachronic account of the Scottish Vowel Length Rule (SVLR). I argue that SVLR represents a Scots-specific phonologisation of part of a pan-dialectal postlexical lengthening rule, which remains productive in all varieties of English, while SVLR has acquired certain properties of a lexical rule, and has been relocated into the lexicon. In becoming lexical, SVLR has neutralised the long/short distinction for Scots vowels, so that synchronically, the underlying vowel system of Scots/SSE is organised differently from that of other varieties of English. It is established that a constrained lexicalist model necessitates the recognition of underlying dialect variation; demonstrates a connection of lexical and postlexical rules with two distinct types of sound change; gives an illuminating account of the transition of sound changes to synchronic phonological rules; and permits the characterisation of dialect and language variation as a continuum.

Chapter 1

Introduction, Aims and Objectives

1. Introduction

This thesis constitutes an attempt to constrain the theory of Lexical Phonology, and to demonstrate that a lexicalist model, appropriately constrained, can provide an illuminating analysis of the synchronic phonology of three reference accents of modern English, as well as being consistent with external evidence from a number of areas, including the characterisation of diachronic developments and dialect differences. I shall focus on three areas of the phonology in which the unenviable legacy of Standard Generative Phonology, as enshrined in Chomsky and Halle (1968; henceforth SPE) seriously compromises the validity of its successor, Lexical Phonology: these are the synchronic problem of abstractness, and the related synchronic-diachronic difficulties of the differentiation of dialects, and the relationship of sound changes and phonological rules. It will be shown that a rigorous application of the principles and constraints inherent in Lexical Phonology, combined with a revision of the notion of the 'ideal' phonology and a concomitant rejection of the SPE-inspired simplicity metric, permits an enlightening account of these areas, and a demonstration that Lexical Phonology, despite its essentially generative character, is not necessarily subject to the failings and infelicities of its predecessor. Finally, just as the data discussed here are drawn from the synchronic and diachronic domains, so the constraints operative in Lexical Phonology will be shown to have both synchronic and diachronic dimensions and consequences.

The aims of the thesis, and the nature of the areas of investigation selected, will be expounded more thoroughly in Section 3 below. First, however, I must introduce the framework which I propose to defend, the theory of Lexical Phonology and Morphology.

2. Lexical Phonology and Morphology: an Overview

2.1. Introduction

Lexical Phonology (LP) is essentially a generative model, in that it has at its core the notion of a set of underlying representations of morphemes, which are converted to their surface forms by passing through a list of ordered phonological rules: it follows that LP has inherited many of the assumptions and much of the machinery of Standard Generative Phonology (SGP; see Chomsky and Halle 1968). LP therefore does not form part of the current vogue for monostratal, declarative, non-derivational phonologies (Kaye, Lowenstamm and Vergnaud 1985, Kaye 1988), nor is it strictly a result of the recent move towards non-linear phonological analyses, with their emphasis on representations rather than rules (Goldsmith 1976, Liberman and Prince 1977, van der Hulst and Smith 1983). However, elements of metrical and autosegmental notation can readily be incorporated into LP, which is primarily a derivational, organisational model; and it should therefore be borne in mind that, although many of my examples below will involve binary features and fairly standard generative rules, it is entirely possible to include metrical formulations of stress and syllabification processes (Giegerich 1986) and autosegmental analyses of lengthening and spreading phenomena (Pulleyblank 1986). However, I shall generally be concerned with derivational rather than representational issues below.

Although LP is not bound to any particular mode of representation or rule formulation, its innovations have not been in the area of phonological representation, but rather in the organisational domain. The main claim is that the phonological rules are split between two components: some processes, which correspond broadly to SGP morphophonemic rules, operate within the lexicon, where they are interspersed with morphological rules. The remainder apply in a postlexical, postsyntactic component incorporating 'allophonic' and phrase-level operations. Lexical and postlexical rules display distinct syndromes of properties, and are subject to different sets of constraints, which will be discussed in detail below.

As a model attempting to integrate phonology and morphology, LP is informed by developments in both these areas. Its major morphological input stems from the introduction of the lexicalist hypothesis by Chomsky (1970), and the re-establishment of morphology as a separate subdiscipline and general expansion of the lexicon this initiated. On the phonological side, the primary input to LP is the abstractness controversy. Since the advent of generative phonology, a certain tension has existed between the desire for maximally elegant analyses capturing the greatest possible number of generalisations, and the often unfounded claims such analyses make concerning the relationships native speakers perceive among words of their language. This drive to construct the simplest possible phonology (where simplicity is calculated with reference to feature counting and maximal rule application) led to the rejection of the classical phonemic level of representation or any equivalent to it, with two unfortunate consequences. First, SGP lost any ready way of encoding surface contrast or the speaker intuitions which seem to relate to the phonemic level. Second, it became even less feasible to constrain the distance of underlying representations from the surface; it is impossible to say that, for instance, underliers should be equivalent to phonemic representations in the absence of alternations, if only the surface and morphophonemic levels of representation are accorded any linguistic significance. Thus, the immensely powerful machinery of SGP, aiming only to produce the simplest overall phonology, created highly abstract analyses. Numerous attempts at constraining SGP were made (Kiparsky 1973), but these were never more than partially successful. Combatting abstractness provided a second motivation for LP, and the furtherance of this aim is also a major theme of this thesis.

A number of outlines of LP are already available (Kiparsky 1982, 1985; Mohanan 1982, 1986; Pulleyblank 1986; Halle and Mohanan 1985; Kaisse and Shaw 1985). The theory, however, is much too recent for a standard version to have developed, and most aspects of LP, including its central tenets, are still under discussion. Available introductions therefore tend to be restricted to presenting the version of LP used in the paper concerned (Kaisse and Shaw 1985 does provide a broader perspective, but is now, in several crucial respects, out of date). Consequently, it may be difficult for a reader not entirely immersed in the theory to acquire a clear idea of the current controversies, which become apparent only by reading outlines of LP incorporating opposing viewpoints. I shall consequently attempt in this section to provide an overview of LP. We shall begin by considering the evolution of LP, and the integration of the two inputs mentioned above. I shall then outline a number of the current controversies within the theory, which will be returned to in subsequent chapters.

2.2. The Development of Lexical Phonology and Morphology

2.2.1. Morphology

> "Within the generative framework, morphology was for a long time quite successfully ignored. There was a good ideological reason for this: in its zeal, post-Syntactic Structures linguistics saw syntax and phonology everywhere, with the result that morphology was lost somewhere in between." (Aronoff 1976, p.4)

The results of this inclusion of the traditional substance of morphology within syntax is that, in the Aspects (Chomsky 1965) model of Transformational-Generative Grammar, no distinction was drawn between word-building and sentence-building operations: all distributional regularities were necessarily captured using transformational rules, which derived related surface structures from a common Deep Structure. This methodology, and the large number of surface relations between words and constructions to be accounted for, had two results: the Deep Structures became progressively more remote from these surface representations, and the transformations became more and more complex and unconstrained.

Chomsky's "Remarks on Nominalization" (1970) is a first attempt to simplify and reduce the power of the transformational component, at the cost of more complex base rules and an enriched lexicon. The paper focusses on derived nominals, such as *criticism, reduction, transmission, recital*, although it is clear that these should be regarded as a test-case, and that Chomsky's proposals generalise to all derivational morphology. Chomsky argues that these nominals are unsuited to transformational derivation, since, for example, the processes involved are characteristically unproductive, while the nominals themselves are semantically idiosyncratic. Chomsky concludes that T-rules should be used only to effect fully regular relationships; processes like nominalisation, which have lexical exceptions, should instead be handled in the lexicon. In the Aspects model, the lexicon had been seen as simply a repository for idiosyncratic information on lexical items; it was now extended and equipped with lexical rules intended to cope with subregularities. Verbs like *criticise, reduce* and their derived nominals, *criticism* and *reduction*, could then be base-generated, and their lexical entries related using these lexical rules.

Chomsky's (1970) suggestions for the structure of this revised lexicon are extremely sketchy; in retrospect, it is clear that "the significance of "Remarks" lies less in what it says itself than in what it caused others to say" (Hoekstra, van der Hulst and Moortgat 1981, p.1). The removal of derivational morphology from the scope of the transformations facilitated the reintroduction of morphology as a linguistic subdiscipline separate from phonology and syntax; and the location of morphological processes in the lexicon initiated a programme of lexical expansion, giving rise to lexicalist syntaxes (Hoekstra, van der Hulst and Moortgat 1981, Bresnan 1982), and eventually to LP.

It is clear that base-generating and storing all word-forms, the course which Chomsky's preliminary remarks seem to suggest, would introduce high levels of redundancy into the grammar. Consequently, most morphological work after "Remarks" (Halle 1973, Siegel 1974, Aronoff 1976, Allen 1978) has proposed that word-formation rules in the lexicon perform morpheme concatenations rather than linking independent lexical entries.

The next innovation involves the organisation of these word-formation processes within the lexicon. Siegel (1974) observes that derivational affixes in English fall into two classes; Class I affixes include *in-*, *-ity*, Adjective-forming *-al*, *-ic* and *-ate*, while Class II includes *un-*, *-ness*, *-er*, Noun-forming *-al* and *-hood*. The former set corresponds to the +-boundary affixes of SPE, and the latter to #-boundary affixes. This class division rests on the morphological behaviour of the affixes, as well as having phonological consequences which we shall explore in 2.2.2. below.

First, as shown in (1), Class I affixes are free to attach to stems, while Class II affixes attach only to words.

(1)	inert	*unert
	intrepid	*untrepid
	insipid	*unsipid
	immaculate	*unmaculate

(from Allen 1978)

Secondly, in multiple affixation, Class I affixes always appear closer to the stem than those of Class II, so that a Class II affix can be added 'outside' a Class I affix, but not vice versa (2).

(2)	atomicity (1 1)	atomicness (1 2)
	hopelessness (2 2)	*hopelessity (2 1)

Siegel proposes that all Class I affixations precede all Class II affixations. This idea is developed and extended by Allen (1978), who reinterprets Siegel's classes as levels, arguing that:

> "the 'level' designation indicates that the morphology is partitioned into blocks of rules, each block having different morphological characteristics. Furthermore ... the morphology is level-ordered. That is, the levels of rule operation are ordered with respect to each other, although no ordering is imposed on individual rules of word-formation." (Allen 1978, p.6)

Derivational word-formation rules attaching Class I affixes will therefore be ordered on Level, or Stratum 1 of the lexicon, while Class II affixations will take place on Level 2, as shown in (3). Underived lexical items pass into Level 1, and to account for the fact that only affixes of Class I attach to stems, it is proposed that stems are acceptable on Level 1, but only words on Level 2. Bound stems must therefore undergo some affixation process on Level 1, or will be ineligible to pass to subsequent levels, as only potential words may leave Level 1.

(3) Underived lexical entries

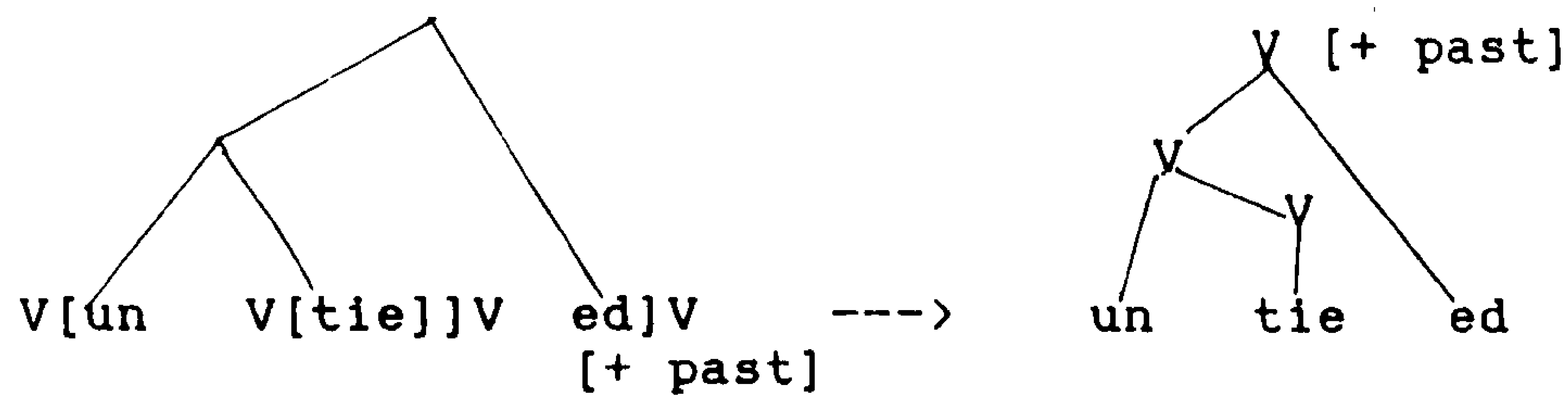
	[ert]	[graph]	[hope]
STRATUM 1	[in[ert]]	-----	----
	-----	[[graph]ic]	----
STRATUM 2	-----	------	[[hope]less]
	-----	[[graphic]ness]	[[[hope]less]ness]
	[inert]	[graphicness]	[hopelessness]

in- Prefixation: Level 1
-ic Suffixation: Level 1
-less Suffixation: Level 2
-ness Suffixation: Level 2

The diagram in (3) incorporates a number of more or less controversial assumptions on the organisation of the lexicon, especially concerning the storage and attachment of affixes. There are two opposing views here, represented by Lieber (1981) and Mohanan (1982, 1986) on one hand, and Kiparsky (1982; partly after Aronoff 1976) on the other.

Lieber argues that all formatives, both stems and affixes, are lexically stored, with appropriately specified features and labels: thus, the suffix *-ness* would be labelled $]_A -]_N$, showing that it is added to an adjective to create a noun, while the verbal suffix *-ed* would carry the label $]_V -]_V$ and the feature [+ past]. Unlabelled binary branching trees, generated by a single context-free rewrite rule, represent the internal structure of words. Formatives are inserted from the lexicon under the terminal nodes of these trees, and features are transferred to higher nodes by Feature Percolation Conventions. In Lieber's model, affixes are heads, and the final affix determines the category and features of the word (4).

(4)



Mohanan (see 1986, p.16) appears to accept a version of Lieber's proposal. He assumes that stems and affixes are stored in a single morpheme list, and are undifferentiated in terms of bracketing. This lack of differentiation extends also to compounding and affixation, as shown in (5).

(5)	[happy]	stem
	[un], [ness]	affixes
	[[happy][ness]]	affixation
	[[green][house]]	compounding

Mohanan (1986, p.16-17) further suggests that part of the information given for each affix in the morpheme list is a stratal specification, giving the domain of application for the rule attaching that affix: the domain may be a single stratum, or a set of continuous strata.

Lieber's (and therefore also Mohanan's) conception of lexical organisation is by no means universally accepted. First, there are several critiques of the notion that affixes are the heads of words. Miller (1985) argues that the concept of head does not generalise easily from syntax to morphology, while Zwicky (1985) defends the traditional viewpoint of stems as major elements and affixes as minor markers of insertion rules, arguing that "the apparently determinant formative in affixal derivation is merely a concomitant of the operation" (p.25). Lieber's system also arguably belongs to the Item-and-Arrangement school of morphology (Hockett 1954), and is therefore subject to the familiar criticisms of this model reiterated in Matthews (1974) and Miller

(1985). For instance, Feature Percolation can cope reasonably well with linear, agglutinative operations, but Lieber is forced to introduce further powerful mechanisms in the form of string-dependent lexical transformations to deal with reduplication and other non-concatenative processes of word-formation.

Although I am unable to consider such criticisms fully here, I believe that they seriously undermine, if not entirely invalidate, Lieber's hypothesis. I therefore prefer to follow Kiparsky (1982), who proposes that stems alone should be stored, and that affixes are introduced by word-formation rules, which again will be marked for their domain of application: "affixes will not then be lexical entries, and they will have no lexical features either inherently or by percolation" (Kiparsky 1982, p.6). Restrictions on the environment in which the affix may be attached, corresponding to Lieber's subcategorisation frame and categorial specification, are instead construed as contextual restrictions on the affix-insertion rules, as shown in (6).

(6) General affixation rule: Insert A in env. $[Y-Z]_X$

Plural:
Insert *-en* in env. $[ox-]_{N,\ +Pl.}$
Insert *-s* in env. $[X-]_{N,\ +Pl.}$

Kiparsky also distinguishes stems (which are stored) from affixes (which are not) by bracketing, and in his model, the outputs of affixation and compounding will also be distinct in terms of bracket configurations, as (7) shows.

(7)		
	[happy]	stem
	[un[happy]]	prefixed form
	[[happy]ness]	suffixed form
	[[green][house]]	compound

Again, I follow Kiparsky's system of representation. These decisions on bracketing and affix insertion are reflected in (3) above, and have rather profound implications: I shall return to the question of the differentiation of affixation and compounding, and defend my position in more detail, in Chapter 2 below. The replacement of the SPE boundary symbols + and # by the single bracket of LP will be justified in Section 2.2.2.

Finally, Mohanan and Kiparsky agree that, although word-internal structure is relevant within the stratum on which it is created, it should not be accessible to rules on subsequent strata. A Bracket Erasure Convention therefore removes all word-internal brackets at the end of each level: this "opacity principle" (Mohanan 1982, p.7) will be further justified in terms of the interaction of phonological and morphological processes in Section 2.2.2.

The extension of the lexicalist hypothesis since Chomsky (1970) has led to the inclusion of morphological processes other than derivation in the expanded lexicon. Allen (1978) proposes that compounding, as well as derivational affixation, should be regarded as lexical, and introduces a third morphological stratum for compounding processes. Halle (1973) had already argued that a generative model of morphology should not be limited to derivation, but that "facts that traditionally have been treated under the separate heading of inflectional morphology must be handled in completely parallel fashion" (p.6). Lieber (1981) follows this lead and adds inflectional affixation to the inventory of lexical processes, on the grounds that inflectional stem allomorphs may form the input to derivation and compounding, so that all these word-formation processes should take place in the same component. The assumption that all morphology is lexical is one shared by most proponents of LP, including Kiparsky (1982, 1985), Mohanan (1982, 1986) and Halle and Mohanan (1985). There have been attempts to argue that inflection should be regarded as syntactic (and therefore postlexical);

Anderson (1982), for instance, presents an analysis of Breton verb agreement which relies on the interaction of inflectional morphology and syntax. However, Anderson's proposals are countered by Jensen and Stong-Jensen (1984), and further persuasive arguments for parallel treatment of inflectional and derivational morphology can be found in Halle (1973) and Miller (1985). I shall therefore adopt the view that processes of inflection, derivation and compounding all take place within the lexicon. To indicate the composition of such a morphological model, I give in (8) the lexical organisation proposed in Kiparsky's early (1982) work on English; note that this is included simply for illustration, and will be amended later.

(8)		LEXICON Underived lexical entries
	LEVEL 1:	Class I derivation, e.g. *-ic*, *-al*$_A$, *in-* Irregular inflection, e.g. *oxen*, *indices*, *kept*
	LEVEL 2:	Class II derivation, e.g. *-ness*, *-hood*, *un-* Compounding
	LEVEL 3:	Regular inflection, e.g. plural *-s*, past *-d*
		SYNTAX

Kiparsky (1982) has thoroughly investigated the morphological consequences of the level-ordering hypothesis. We have already mentioned the phenomenon of stacking (the fact that affixes from a later stratum may be attached only 'outside' those attached earlier in the lexicon, not nearer the stem; this has become known as the Affix Ordering Generalisation (Selkirk 1982)), and also the ability of Level 1 affixes alone to attach to bound stems. I shall consider one further example of the morphological predictions of the lexicalist model, namely blocking.

The blocking effect, which Aronoff (1976) calls "pre-emption by synonymy", has two subcases:

1. Forms may not usually receive two affixes with the same semantic content. So, we have *feet* and *oxen* but not additionally **foots*, **oxes*, and zero-derived *guide*, *spy*, but not **guider*, **spier*.
2. Lexical items with some inherently marked morphological feature do not additionally acquire an affix which marks this feature. Thus, *people*, which is already inherently [+ plural], does not receive plural *-s*. Linked to this is the failure of semantically equivalent affixes to accumulate on a single stem; so, *oxen* does not undergo regular plural suffixation to give **oxens*.

Kiparsky (1982) argues that these blocking phenomena can be readily explained within the lexicalist model, by two slightly different strategies.

1) Doublets are prohibited by making morphological rules obligatory in the unmarked case: so, *ox*, if it carries the feature [+ plural], is marked to undergo a special Level 1 rule attaching *-en*. The form is not then eligible to undergo the Level 3 regular plural rule. In cases where doublets do obtain, as with *indices* - *indexes*, Kiparsky assumes that the special rule is exceptionally optional. The system for blocking derivational doublets is identical (although less rigid): the deverbal agent noun *spy* is zero-derived on Level 1, and may not additionally acquire the functionally identical Level 2 agentive marker *-er*. Blocking is therefore seen as "pre-emption by prior application" (Kiparsky 1982, p.8). Kiparsky uses these facts of blocking to support a number of hypotheses on the organisation of the lexicon: notably, he argues that, when a set of processes is involved in a blocking relationship, the special rules with restricted

applicability must precede the general, regular processes. It follows that rules on later levels are more productive, and more semantically uniform, than those higher in the lexicon.

2) The exclusion of functionally equivalent stacked affixes and double marking of features is rather more complex, and requires the introduction of one of the principal constraints of LP, the Elsewhere Condition (= EC). The EC governs disjunctive application of rules, and is given in (9).

> (9) "Rules A, B in the same component apply disjunctively to a form Φ if and only if
> (i) The structural description of A (the special rule) properly includes the structural description of B (the general rule).
> (ii) The result of applying A to Φ is distinct from the result of applying B to Φ.
> In that case, A is applied first, and if it takes effect, then B is not applied."
> (Kiparsky 1982, p.8)

Kiparsky makes the further assumption that every lexical entry, and the output of every layer of derivation, is an identity rule L, where the structural description and structural change of L are both L. The lexical entry for *people* is then inherently marked [+ plural], so that L = $[\text{people}]_{+N,\ +Pl.}$. L in this case is disjunctive with the regular plural rule by (9): the rule $[\text{people}]_{+N,\ +Pl.}$ properly includes the structural description $[X\ -\ ]_{+N,\ +Pl.}$, and the outputs, *people* and *peoples*, are distinct. The identity rule, as the special rule, then takes precedence. Similarly, **oxens* is impossible, since the Level 1 derived lexical entry $[\text{oxen}]_{+N,\ +Pl.}$ is again disjunctive with the regular plural rule. The Elsewhere Condition has had profound consequences for the development of lexicalist theory, and we shall return to it during the next section.

2.2.2. Phonology

The essentials of the organisation of the morphological component of the lexicon assumed in LP should now be clear. The lexicon consists of a number of levels or strata, which are ordered. Inflectional and derivational affixation, and compounding are effected by word-formation rules, which apply on a specified level or set of levels. Morphological phenomena like stacking, blocking and attachment of certain classes of affixes to stems as well as words fall out from this model, with the addition of a single constraint, the Elsewhere Condition (EC). However, the morphology is not the sole inhabitant of the lexicon in LP; rather, there is considerable interaction with the phonology.

Siegel (1974) did not motivate her division of English derivational affixes into Classes I and II solely by reference to morphological factors, but adduced additional evidence from their phonological behaviour. Siegel focusses on the interaction of word-formation and stress, noting that Class I suffixes shift the stress of the stem, while Class II affixes are stress-neutral (10). However, Class II affixes may have constraints on their insertion, governed by the position of stress on the stem; thus, *-al*$_N$ attaches only to verbs with final stress. Such constraints do not affect Class I affixes (11).

(10)	válid	validity	válidness
	átom	atómic	átomise
	párent	paréntal	párenthood

(11)	arríve	arrival
	refúse	refusal
	édit	*edital
	depósit	*deposital

Siegel consequently proposes that cyclic phonological rules, including word-stress assignment, should operate between Class I and Class II affixation in the lexicon;

Class I affixes will then be added before stress-placement, so that the position of stress on an underived base and on a Class I affixed form may be calculated differently by the stress rules. Class II affixation will occur too late to influence stress assignment, but may be sensitive to the already determined position of stress.

Allen (1978) observes that this interaction of morphology and phonology is not limited to the stress rules. She notes that *in-* (Class I) undergoes Nasal Deletion, so that [in[legal]] becomes *illegal*, but that [un[lawful]], with Class II *un-*, surfaces as *unlawful* rather than **ullawful*. Allen suggests that on each stratum, a particular boundary will be assigned to structures derived on that stratum: the boundary will be + on Level 1, and # on Level 2. Nasal Deletion will then be formulated to apply across + but not #.

Mohanan (1982) and Kiparsky (1982) translate these preliminary observations into a much more integrative model. The central assumption of LP is that each lexical level constitutes the domain of application for a subset of the phonological rules, as well as certain word-formation processes. The phonological rules do not apply between the morphological strata, as Siegel suggested, but are assigned to them. The output of every morphological operation is passed back through the phonological rules on that level; this builds cyclicity into the model, and allows for the progressive and parallel erection of phonological and morphological structure, as shown in (12).

(12)

Underived lexical entries

```
Level 1
Morphology                       Phonology
                   <---           [átom]
[[átom]ic]         --->           [[atóm]ic]

                                  [atómic]

              Level 2
```

This model also removes the need for distinct boundary symbols such as + and #, while still accounting for the facts of rules like Nasal Deletion (Allen 1978). If Nasal Deletion is located on Level 1, it can operate on structures derived using *in-*, which is attached on Level 1. Nasal Deletion will, however, be unable to apply to structures derived on Level 2; this guarantees that **ullawful* cannot be derived, without assuming that the prefixes *in-* and *un-* carry different boundaries (see (13)).

(13)a. Nasal Deletion (Domain: Stratum 1)
[+ nasal] --> ϕ / --- [+ sonorant]

```
   b. Stratum 1
    [legal]            [law]
    [in[legal]]         ---              in- Prefixation
    [i [legal]]         ---              Nasal Deletion

      Stratum 2
    [ilegal]           [law]
      ---              [[law]ful]        -ful Suffixation
      ---            [un[[law]ful]]      un- Prefixation

    [illegal]          [unlawful]
```

The distinct boundaries of SPE are therefore replaced by a single bracket, "which is actually nothing more than the concatenation operator on both the morphological and syntactic levels" (Strauss 1979, p.394), and their effects are captured by level ordering.

We can now turn to the second major input to LP, the abstractness controversy. I shall approach the lexicalist contribution to the reduction of abstractness by considering Kiparsky's (1982) account of Trisyllabic Laxing (TSL) in English.

TSL laxes (or shortens) any vowel followed by at least two vowels, the first of which must be unstressed; the rule is formulated in (14a) and some of its effects shown in (14b).

(14)a. V --> [- tense] / --- $C_0V_iC_0V_j$
where V_j is not metrically strong
(Kiparsky 1982, p.35)

b. declare - declarative
divine - divinity
table - tabulate

TSL was problematic for the SGP model because of the presence of two classes of exceptions; examples are given in (15).

(15)a. mightily bravery weariness
b. ivory nightingale Oberon Oedipus

LP can account for the first set of exceptions in a principled way; since all of these include Class II suffixes, while the forms undergoing TSL in (14b) all have Class I affixes, we simply order TSL on Level 1 of the lexicon. The forms in (15a) will only become trisyllabic on Level 2, beyond the domain of TSL. In SPE, TSL was applicable over + but not #; however, as we have seen, the effects of such boundary constraints are captured in LP by the fact of level-ordering.

The exceptions in (15b) are more problematic. The SGP methodology would involve adjusting the underlying representations of forms like *nightingale*, *ivory* so that the structural description of TSL is not met. For instance, Chomsky and Halle assigned *nightingale* the underlying form /nIxtVngǣl/; further rules were then required to transform /Ix/ into surface [aI]. However, this stratagem promotes abstractness, and is also essentially ad hoc and non-explanatory, given that not all underlying forms can be manipulated in this way.

Kiparsky also notes the existence of a further problematic set of words (16).

(16) camera pelican enemy

The forms in (16) "have two possible derivations, while only one is ever needed" (Kiparsky 1982, p.35). These words could be derived from underlying representations with a short, lax vowel in the first syllable, but the more likely derivation in SGP would involve positing long, tense vowels at the underlying level, and giving these non-alternating forms a 'free ride' through the TSL rule. The Standard Generative drive for maximal generality of rules, and the attendant principle that surface irregularity should stem from underlying regularity, thus add considerably to the abstractness of the model.

Kiparsky claims that, within LP, a single constraint can explain the non-application of TSL in the forms in (15b), and prohibit the derivation of the words in (16) from remote underliers. Kiparsky refers to work on the strict cycle in phonology (Kean 1974, Mascaró 1976, Rubach 1984), where it is claimed that cyclic rules are only permitted to apply in derived environments. The Strict Cycle Condition (SCC), which effects this restriction, is formulated in (17).

> (17) SCC: Cyclic rules apply in derived environments. An environment is derived for rule A in cycle (i) iff the structural description of rule A is met due to a concatenation of morphemes at cycle (i) or the operation of a phonological rule feeding rule A on cycle (i).

TSL, as a cyclic rule subject to SCC, will be permitted to apply in *declarative, divinity*, etc., due to the prior application of a Level 1 affixation rule on the same cycle. However, it will not be applicable in *ivory* and *nightingale*; these happen to meet the structural description of TSL at the underlying level, but they are not trisyllabic by virtue of any concatenation operation, nor do they undergo any phonological rule feeding TSL. Their underliers can therefore be listed as equivalent to their surface forms, and their apparent exceptionality with respect to TSL follows automatically from the SCC.

Likewise, the mere assignment of a tense vowel to the first syllable of forms like *pelican, enemy* and *camera* will no longer enable these to be passed through TSL, since these will constitute underived environments for the laxing rule. The SGP practice of adjusting the underliers of such non-alternating forms to provide 'free rides' through the phonological rules is therefore no longer viable, as the appropriate surface form [ɛnəmi] is no longer derivable from [ēnɛmI], if we assume the validity of SCC and accept that TSL is a cyclic rule.

In the earliest versions of LP (Mohanan 1982, Kiparsky 1982) it was assumed that all lexical rules were cyclic, as shown in the outline of Kiparsky's model for English given in (18).

```
(18)                  Underived lexical entries
                                    ↓
     Irregular inflection  <--  Stress          LEVEL 1
     Class I derivation    -->  Laxing

     Class II derivation   <--  Compound        LEVEL 2
     Compounding           -->  stress

     Regular inflection    <--  Sonorant        LEVEL 3
                           -->  resyllabification

                           SYNTAX
```

(adapted from Kiparsky 1982, p.5)

In such a model, the domain of SCC would be the entire lexicon, and all lexical phonological rules would be restricted to derived environments. This early, strong claim has been somewhat weakened since, so that it is now generally accepted that not all cyclic rules are subject to SCC, and that not all lexical rules are cyclic. I shall discuss these exclusions in turn.

1. Exemption of cyclic rules from the SCC.

Rules which build structure rather than changing it should not be subject to SCC (Kaisse and Shaw 1985), to allow stress rules, and syllabification rules erecting metrical structure, to apply cyclically on the first cycle in underived environments. Stems like *atom* will then be eligible for stress assignment and syllabification without undergoing previous morphological or phonological processes. It should be noted that stress rules in English, where stress is arguably not present underlyingly, will be structure-building and exempt from SCC, but in a language like Sanskrit, where stress is specified in underlying representations, they will be structure-changing (Halle and Mohanan 1985). Kiparsky (1985) further suggests that an initial application of a structure-building rule should not be accepted as creating a derived environment for a subsequent structure-changing rule.

2. Non-cyclic lexical rules

Halle and Mohanan (1985) point out that there are a number of phonological rules which, due to their interaction with morphological processes and other rules of the lexical phonology, should themselves apply in the lexicon, but which do not obey SCC. For instance, Velar Softening is clearly sensitive to morphological information, since it applies in Class II derived forms like *magi*[ʃ]*ian*, but not medially in compounds, as in *magi*[k] *eye*. Furthermore, Velar Softening must be ordered before the Level 2 rule, Palatalisation, and Halle and Mohanan therefore argue that it should also apply on Level 2. However, Velar Softening also applies in underived forms like *reduce* and *oblige*, although this should be prohibited by the SCC if Velar Softening is a cyclic rule. Halle and Mohanan produce similar arguments for a number of the core rules of English vowel phonology, including the Vowel Shift Rule; again, they propose that Vowel Shift should be ordered on Level 2 of the lexicon, but again this rule is said to apply, in apparent contravention of SCC, in underived forms like *divine, sane* and *verbose*.

These findings have provoked various limitations of the power of SCC. Kiparsky (1985) suggests that rules on the last lexical level are exempt from SCC, although he does not explicitly state whether he believes rules on this 'word level' to be cyclic or non-cyclic. A far more radical solution is adopted by Halle and Mohanan (1985) and Mohanan (1986), who argue that "the cyclicity of rule application in Lexical Phonology ...is a stipulation on the stratum" (Halle and Mohanan 1985, p.66). That is, a decision must be made on the cyclicity of every stratum, and cyclic and non-cyclic strata may be interspersed in the lexicon. Moreover, Mohanan (1986, p.47) proposes that all lexical strata are non-cyclic in the unmarked case, reversing Kiparsky's earlier hypothesis on the relationship between cyclicity and lexical application.

The lexical structure which Halle and Mohanan (1985) propose for English, with examples of the processes on each level, is shown in (19). Halle and Mohanan argue for four lexical levels; three are cyclic, but Level 2, the domain of Velar Softening and the Vowel Shift Rule, is non-cyclic. On cyclic strata, forms pass through the phonology, then to the morphology, and are resubmitted to the phonology after every morphological operation. On non-cyclic strata, however, all appropriate morphological rules apply first, and the derived form then passes through the phonological rules on that level once only.

(19)

		Underived lexical entries ↓	
Irregular inflection Class I derivation	<--- --->	Stress Shortening...	LEVEL 1
Class II derivation	--->	Vowel Shift Velar Softening...	LEVEL 2
Compounding	<--- --->	Compound stress	LEVEL 3
Regular inflection	<--- --->	Sonorant syllabification	LEVEL 4

The matter of the number of cyclic and non-cyclic strata is inextricably linked with the problem of limiting the overall number of strata. Kiparsky, as we have seen, proposed three levels for English; Halle and Mohanan (1985) argue for four. The apparent lack of any principled limitation on the number of lexical levels proposed has cast serious doubts on the validity of LP; it would be theoretically possible, for instance, to propose a level for every rule, or some arbitrary number of levels with all rules applying on all levels. Even if individual analysts refrain from positing unrealistically high numbers of levels, the potential for unconstrained stratification remains, making a lexicalist model at worst unconstrainable and at best, language-specific; and in any case, we have no criteria to tell us what number of strata would be 'unrealistically high'.

Recent emendations to LP by Booij and Rubach (1987) aim to provide a universal lexical organisation, a constrained number of strata, and a principled division of cyclic from non-cyclic levels. On the basis of evidence from Dutch, Polish, French and English (admittedly a restricted corpus), Booij and Rubach restrict the lexical component to two levels, the first cyclic and the second postcyclic. This model, applied to English, gives the lexical organisation shown in (20). I shall simply accept this restrictive model for the moment; Chapter 2 will be largely devoted to demonstrating that this model should be preferred to that proposed by Halle and Mohanan (1985), while further revisions to the domain assignment of certain phonological rules will be made in Chapter 3.

(20)

```
                                  Underived lexical items
                                            ↓
Irregular inflection    <---    Stress              LEVEL 1
Class I derivation      --->    Laxing...

Class II derivation             Vowel Shift         LEVEL 2
Compounding             --->    Compound Stress
Regular inflection              Palatalisation...
```

Although a good deal of discussion in LP has been devoted to the structure of the lexicon, not all phonological rules are lexical; some apply in a postlexical component, located after the syntax. If the lexical phonology corresponds roughly to the morphophonemic rules of SGP, the postlexical rules may be thought of as allophonic. The two types of rules display entirely different syndromes of properties, and I shall now consider a number of criteria useful in determining the component in which a given rule applies.

1. Ordering

If a rule necessarily applies before a rule which must, for independent reasons, be lexical, then it must itself be lexical. Similarly, a process which crucially follows a postlexical rule will be postlexical.

2. Cyclicity

If a rule can be shown to be cyclic, it must be lexical; more specifically, in Booij and Rubach's (1987) model, it must apply on Level 1 of the lexicon. Only such Level 1 rules will then be governed by SCC. Further evidence must, however, be adduced to decide whether a non-cyclic rule is postcyclic or postlexical.

3. Sensitivity to morphological information

Mohanan (1986) regards this as the central property of the lexical syndrome, replacing Kiparsky's (1982) earlier equation of lexical application with cyclicity. Any rule which is conditioned or blocked by the presence of brackets, exception features, or morphological features such as [± Latinate] in the string, is necessarily lexical. The expected sensitivity of lexical phonological rules to word-internal structure follows from their interaction with the morphology, while the opacity of such internal structure for postlexical processes is a natural result of bracket erasure, which removes all internal brackets at the end of each level, and therefore at the output of the lexicon.

4. Application across word boundaries

Only postlexical phonological rules may apply between as well as within words: the rules of the lexical phonology have access only to single words, but the postlexical processes are ordered after syntactic concatenation, and can therefore apply over larger constituents. Rules like Flapping in General American must therefore apply postlexically, given the examples in (21).

(21) Flapping:
ea[D]ing 'eating'
ea[D] in the café 'eat in the café'

5. Exceptions

Lexical rules may have lexically marked exceptions, but postlexical ones apply wherever their structural description is met. Bresnan (1982) similarly argues that only lexical syntactic rules may have exceptions, and it seems that the correlation of lexical application with exceptionality results from the early transformational-generative characterisation of the lexicon as a store of idiosyncratic information. Furthermore, it was the irregular, exceptional tendencies of derivational morphology which prompted Chomsky (1970) to move it into the lexicon, initiating the lexical expansion which has led to LP.

6. Structure Preservation

Postlexical rules may create novel segments and structures, but lexical rules are structure preserving, and may not create any structure which is not part of the underlying inventory of the language. I give Borowsky's (1986, p.29) definition of Structure Preservation in (22).

(22) Structure Preservation:
Lexical rules may not mark features which are non-distinctive, nor create structures which do not conform to the basic prosodic templates of the language.

The rule of Aspiration must therefore be postlexical, since it manipulates a feature, [± aspirated], which is not distinctive for English. Structure Preservation is the third major constraint of LP, after the Elsewhere Condition and the Strict Cycle Condition and, like the other two, is rather controversial. I shall return to it below.

Mohanan (1986) makes a number of revised proposals on the structure of the postlexical component, which he sees as bipartite. He suggests that forms exit the lexicon and enter first a syntactic submodule, including postlexical phonological rules which make necessary reference to syntactic information, such as the rule governing the *a/an* alternation in English. This submodule creates a syntactico-phonological representation of phonological phrases, which then pass into a postsyntactic submodule. This contains phonetic implementation rules, which "spell out the details of the phonetic implementation of a phonological representation in terms of *gradient* operations" (Mohanan 1986, p.151). In other words, Mohanan, like Chomsky and Halle (1968), argues that binary features become scalar at a late stage of the derivation. For instance, Mohanan notes that the degree of aspiration of voiceless stops in English depends on the degree of stress, and that scalar values are therefore required in the phonetic implementation submodule. Mohanan emphasises that these implementational rules are not universal and purely physiological, but low-level and language-specific; for instance, the dependence of aspiration on stress does not hold in Hindi or Malayalam.

Mohanan further argues that "mappings in the implementational module may dissolve phonological segments" (1986, p.173). At the eventual phonetic level, the derivation will then produce features which are assigned scalar values and aligned independently with a timer. The potential for overlap which this alignment provides seems promising for the treatment of coarticulation and timing, but this hypothesis, like most of Mohanan's proposals on postlexical organisation, must be seen as extremely tentative.

Finally, it should be noted that rules need not be restricted to one component; they may apply both lexically and postlexically. This is the case, for instance, for Palatalisation in English, which must, for reasons of ordering and interaction with the morphology, apply on Level 2 of the lexicon, but which also operates between words, as shown in (23).

(23) Level 2:

[rēs]	
[[rēs]jəl]	*-ial* suffixation
[[rēʃ]jəl]	Palatalisation

Postlexical:
I'll race you [rēsjə] or [rēʃjə]

Kiparsky (1985) extends this notion of application in two components, proposing that a rule which appears to apply in a gradient fashion may be a postlexical reflex of a rule which also applies categorically in the lexicon.

I shall conclude this section on the development of LP by considering, and stating my position on a number of other current controversies in the theory. These are the notion of the domain of application of a phonological rule; the nature of the 'lexical level' of representation; the formulation and interrelations of the three major constraints of LP; and the matter of underspecification.

1. The Domain of Application of Rules

In Kiparsky's early (1982) model of LP, the facts of English phonology, where the majority of phonological rules apply on only one level, motivated the hypothesis that "...the phonological rules at each level of the lexicon and in the postlexical component constitute essentially independent mini-phonologies" (Kiparsky 1985, p.86). Each rule is assigned to a particular level or component, and each level in turn is defined by the rules which are located there. Although this model is perhaps suitable for English phonology in the unmarked case, there are several English phonological processes which must apply in more than one component, as seen for Palatalisation in (23) above: such rules would have to appear twice in the grammar, in this approach.

Mohanan (1982) and Mohanan and Mohanan (1984) argue that such a model is untenable for Malayalam, a language with much more overlap between lexical levels and between the postlexical and lexical components. Rather than multiply listing each rule, Mohanan (1982, 1986) proposes that the rules should each be listed once, but that each should carry a domain specification. In this model, "rule systems do not define the modules of the grammar, but are, in some sense, parallel to them" (Mohanan 1986, p.13).

Mohanan claims that this notion of phonological modularity parallels developments in syntax. In early transformational-generative syntax (Chomsky 1965), rules 'belonged to' individual modules; in the more recent Government and Binding theory (Chomsky 1981), however, rules are essentially independent of modules, so that "the same set of rules is allowed to apply in multiple modules, with different consequences" (Mohanan 1986, p.13). Kiparsky (1985) accepts this revision of domain assignment, and suggests that the marking of rules for application on particular levels may be more restricted than Mohanan's model implies. Kiparsky's view is that the constraints of LP, which operate differently in different modules, may themselves restrict rule operation; consequently, apparently quite different processes may be recognised as lexical and postlexical applications of the same rule, with distinct inputs and outputs determined by the differential application of principles like SCC and Structure Preservation in the two components.

Kiparsky's tentative conclusion is that "it may, in fact, be possible to restrict the marking of domains to specifications of the form 'rule R does not apply after level n'" (Kiparsky 1985, p.87). A more extreme statement of the same kind of view appears as Borowsky's (1986, p.13) Strong Domain Hypothesis, which states that "all rules which are marked for a particular domain of application apply at Level 1 only". All other rules are available throughout the phonology, and apparent restrictions to certain levels result from the principles of the theory, not from any rule-specific stipulation.

In Borowsky's model, the unmarked mode of application would involve operation both lexically and postlexically, and at all lexical levels. Note, however, that Borowsky's hypothesis refers to potential application, with actual application often severely restricted by the constraints of LP. Her proposal cannot therefore be invalidated simply by observing that there are apparently few, if any rules which do apply on all levels and in both components. Mohanan (1986) takes a rather different view; the result of his principles of domain assignment (given in (24)) is to make postlexical application only the unmarked option. This controversy will not have much relevance for what follows, although evidence on the relationship of sound changes and phonological rules to appear in Chapter 6 will suggest that the postlexical level may be the unmarked domain for newly introduced changes; lexicalisation may then optionally proceed.

(24)

> In the absence of counterevidence, choose the minimum number of strata as the domain of a rule.
>
> In the absence of counterevidence, choose the lowest stratum as the domain of a rule.
>
> The domain of a rule may not contain nonadjacent strata.
>
> (Mohanan 1986, pp.46-7)

2. The Lexical Level

Unlike more standard versions of Generative Phonology, LP has three linguistically significant levels of phonological representation. It shares two with the SPE model; these are the underlying representations of individual morphemes, and the phonetic representation, the output of the morphology, phonology and syntax, which contains near-surface forms of phrases. However, in LP there is a third level, the so-called Lexical Representation (Mohanan 1986, p.10), which incorporates the state of the phonological derivation at the output of the lexicon, and therefore involves neither morphemes nor phrases, but words.

The Lexical Representation shares many features with the classical phonemic level of pre-generative phonology, although the two are not necessarily identical. Mohanan (1982, pp.12-13; 1986, Ch.7) argues that the lexical level allows LP to refer easily to surface contrast, and that this level is relevant in language acquisition, perception and production. He discusses a number of phenomena which seem to have the lexical level as their locus: for instance, speaker judgments on whether sounds are the same or different seem to be based on this level; speech errors which permute segments take place here; and secret code languages like Pig Latin seem to perform a coding operation on the lexical representation, then apply the postlexical rules to the output. Mohanan also proposes that speakers enter words in the mental lexicon in their lexical representations, and that

> "underlying representations of the constituent morphemes of a word are arrived at as and when the speakers come across morphologically related words which provide evidence for the underlying forms" (Mohanan 1986, p.194).

Mohanan argues, then, that the lexical level is psychologically relevant, and redeems the losses SGP suffered by rejecting the phonemic level, without reintroducing the theoretical difficulties which plagued classical phonemic theory.

3. Constraints

In the discussion above, three principles of LP were introduced; these are the Elsewhere Condition, the Strict Cycle Condition, and Structure Preservation. The reason for returning to them here is that there have been proposals to link the first two, while the interpretation of the third in unclear.

Kiparsky (1982) concedes that it may be undesirable to introduce a new constraint, in the shape of SCC, into lexical theory. However, he argues that the problem of proliferating constraints does not arise in this case, since "the Strict Cycle Condition does not have to be stipulated in the theory. A version of it is deducible from the Elsewhere Condition" (Kiparsky 1982, p.46). This deduction rests on the assumption that each lexical entry, as well as the output of every morphological process, is an identity rule. If we accept this, then, in the case of Trisyllabic Laxing discussed above, the rules /nītVngǣl/ and Trisyllabic Laxing will be disjunctive rules by the Elsewhere Condition: the structural description of the identity rule properly includes that of TSL, and the result of applying them would be different, since applying TSL would give a lax vowel where /nītVngǣl/ specifies a tense one (see (9) above). Furthermore, this version of SCC accounts for the apparently exceptional behaviour of cyclic rules which assign stress and metrical structure: these structure-building rules introduce features rather than providing contradictory feature specifications, and the results of applying such a rule will therefore not be distinct from the underived lexical entry, or identical rule. Conjunctive application is consequently permitted.

Kiparsky therefore argues that these two constraints are subsumed by "the essentially trivial Elsewhere Condition, which may conceivably be reducible to a more general cognitive principle" (Kiparsky 1982, p.58). Mohanan and Mohanan (1984), however, challenge this conclusion, on the grounds that the identity rules Kiparsky proposes lack independent motivation. Kiparsky (1985) accepts this criticism and returns to stipulating SCC independently.

A stratagem for deriving SCC from EC without badly-motivated identity rules has now been promoted by Giegerich (1988). Giegerich adopts Selkirk's (1982) hypothesis that stratum 1 affixation operated on roots, while stratum 2 processes require words, and proposes a general Root --> Word rule which performs the conversion necessary to allow stratum 1 forms to be input to stratum 2; this rule is given in (25).

(25) $[X]_{Yr}$ --> $[X]_{Y}$ (where Y = N, V, A)

Giegerich argues that these Root --> Word rules fulfil the same function as Kiparsky's identity rules, but are additionally morphologically motivated. Root --> Word rules will operate on every cycle, following any morphological concatenation, and EC will then block subsequent structure-changing phonological rules not fed by affixation or by a preceding phonological rule on the same cycle. This blocking effect will also be limited to the first stratum: since roots are acceptable only on Level 1, Root --> Word rules can apply only here. If Level 1 is the sole cyclic stratum, as it is in Booij and Rubach's (1987) model, then the link of application in derived environments and cyclicity remains. However, the possibility now arises that the restriction to derived forms is a property of Level 1 rules, not of cyclic ones.

It seems, then, that SCC and EC may not have to be stipulated independently, although, as Giegerich (1988) admits, the consequences of his proposal require fuller investigation. However, for illustrative purposes, I shall generally refer to SCC separately from EC in the chapters below.

The third major constraint of LP is Structure Preservation, which was given in (22) above in Borowsky's formulation. Borowsky seems to intend that Structure Preservation should prohibit the introduction of non-distinctive features in the lexical phonology, and this view is shared by Kiparsky (1985, p.87), who defines Structure Preservation as follows:

> "Structure Preservation is the result of constraints operating over the entire lexicon. For example, if a certain feature is non-distinctive, we shall say that it may not be specified in the lexicon. This means that it may not figure in non-derived lexical items, nor be introduced by any lexical rule, and therefore may not play any role at all in the lexical phonology."

However, it is not entirely clear from the literature whether Structure Preservation is to be seen as feature or segment based, since Borowsky (1986) later paraphrases Structure Preservation as disallowing the lexical application of any rule whose output is distinct from any of the phonemes of the language concerned. If we accept that Structure Preservation is segment-based, we immediately encounter a further ambiguity, in that Borowsky does not state whether these 'phonemes' are to be equated with the underlying or lexical representation. It is unlikely that she should intend Structure Preservation to be bound to the lexical alphabet, since she also proposes that Structure Preservation 'switches off' after Level 1, so that its effects do not hold on Level 2; a rule which, on other grounds, should apply on Level 1 would then be constrained by requiring its output to be included in a segment set not derived until after the operation of the non-structure preserving rules on Level 2. On the other hand, if we assume that Structure Preservation is defined over the underlying alphabet, and holds throughout the lexicon, the underlying and lexical alphabets will necessarily be identical, contrary to Mohanan's (1982, 1986) assumptions. The third possibility, that Structure Preservation is bound to the underlying alphabet but holds only on Level 1, represents an unwelcome weakening of the theory. I shall therefore assume that Structure Preservation prohibits the introduction of novel, non-distinctive features, but not of novel combinations of distinctive features; thus, the lexical and underlying segment inventories need not be identical. I also propose that Structure Preservation holds throughout the lexicon. In Chapter 6, I shall present evidence which suggests that rules exhibiting most properties of the lexical syndrome but violating Structure Preservation should nonetheless be permitted to apply in the lexicon, without restricting the domain of Structure Preservation to Level 1. I shall argue that such temporary violations indicate a newly lexicalised process, and that the reassertion of Structure Preservation may dictate the future direction of change.

4. Underspecification

A number of proponents of LP argue against fully specified lexical entries; Kiparsky (1982), for instance, provides a number of arguments for partially specified feature matrices, including the clear distinction which emerges in such a model between accidental and systematic gaps. Underspecification generally operates in tandem with markedness theory, as is evident from Borowsky's condition that underlying representations "shall not contain phonological features which are predictable either by universal conditions on markedness or by language specific phonological rules" (1986, p.44).

As Kiparsky (1982, p.53) observes, the assumption of Underspecification will allow cyclic, lexical rules to apply on the first cycle to fill in feature specifications which are not lexically specified; again, this will not violate SCC/EC, since such rules will introduce features rather than producing clashing feature specifications. Redundancy rules and morpheme structure rules, given this hypothesis, are simply rules of the lexical phonology applying under special circumstances.

Although I defer in general to Kiparsky's arguments, I shall operate below with a full-entry theory of the lexicon. There are two reasons for this decision. First, my proposals and discussions of phonological rules will be clearer if it is obvious that I am dealing with feature-changing rather than blank-filling or default applications. Second, and on a more theoretical level, the implications of underspecification for lexical theory have not yet been fully worked out, and its potential concerns me. For instance, Borowsky argues that underspecification may replace SCC, since many lexical rules will no longer be prohibited from applying on the first cycle; they will simply operate in a blank-filling capacity. I am not convinced that this hypothesis advances the aim of LP to combat abstractness; it may instead be a retrograde step, in allowing abstract, underspecified underlying representations. Little attention has been paid to the problems engendered by underspecification; how, for example, would a child acquire an underspecified (or even an unspecified, see Anderson, 1987) segment? It is clear that Borowsky's answer would involve Universal Grammar, since she says explicitly (1986, p.20) that she regards the principles of LP as given by UG. However, this assumes without motivation that all lexicalists are willing to make the leap of faith consistent with accepting a richly structured Universal Grammar. I prefer to approach abstractness and the associated problems to be described in the next section using principles inherent in LP, rather than adopting underspecification theory, which has not yet been fully assessed, and may be found to compromise attempts to produce a more concrete phonology.

3. Aims and Objectives

Although I would regard the resolution of the phonological controversies outlined above as crucial to the furtherance of lexicalist theory, properties of the phonology have been the subject of relatively little research in LP. Instead, attention has focussed on problematic aspects of the morphological component of LP. This interest is partly historically motivated; we have seen that LP took its initial inspiration from developments in morphology, and the effects of morphological operations on the phonology. A recent loss of interest in derivational phonologies and their problems, as opposed to the nature of phonological representations (Goldsmith 1976, Liberman and Prince 1977, van der Hulst and Smith 1983, Kaye, Lowenstamm and Vergnaud 1985, Anderson and Ewen 1987) has also encouraged this focus on the morphological rather than the phonological aspects of LP.

Some of the problems identified in this morphological research are relatively minor. For instance, certain affixes appear to display properties of both Class I and Class II; thus, *-ism* is stress-shifting in *Cathólicism* from *Cátholic*, but stress-neutral in *Prótestantism* from *Prótestant*. However, given Mohanan's (1986) contention that word-formation rules, like phonological rules, are specified for their domain of application, and that this domain may include multiple adjacent strata, the operation of some affix-attachment processes on Levels 1 and 2 is surely expected. This approach does not require the separate listing of two superficially identical suffixes which behave differently; the identity of form follows from the fact that there is only one suffix-attachment rule, while the behavioural discrepancy results from the operation of this rule at different levels of the lexicon, where it is subject to different constraints and interacts with different phonological rules. Other morphological concerns are less tractable; for instance, Aronoff and Sridhar's (1983) contention that the Affix Ordering Generalisation is invalid and thus that morphological level-ordering is untenable has led Halle and Vergnaud (1987) to adopt a curtailed, phonology-only version of LP, lacking the integrational aspect which motivated the theory in the first place. Further critiques of the same sort are included in Sproat (1985) and Szpyra (1988).

I do not intend to pursue these morphological matters; I do, however, consider that these problems will ultimately be solved, and that Halle and Vergnaud's retreat is over-hasty. I shall therefore adopt, in essence if not in detail, the morphological organisation proposed by Kiparsky (1982) and Mohanan (1982, 1986).

My aim is, instead, to return to the phonological aspects of LP, where I believe there is important work still to be done. In particular, I believe that LP may have progressed less far from SGP than its proponents claim, and that the theory may be seriously compromised by the adherence of some lexicalists to certain tenets of the SPE model. Standard Generative Phonology was probably criticised most on three counts: its abstractness, lack of psychological reality, and coherence with solely internal evidence. Embedded in the lexicalist literature are strong claims that LP has overcome, or can overcome, these problems of its predecessor, and I shall now consider these claims in turn.

1. Abstractness

Hoekstra, van der Hulst and Moortgat (1981) argue that lexicalist linguistic theories are in general more surface-oriented and less abstract than their standard generative precursors. This is certainly true of Kiparsky's version of LP; Kiparsky had already contributed to the abstractness controversy (particularly in papers published in 1973), and he proposes that the Strict Cycle Condition should be used to combat 'free rides' to remedy the deficits of his own Alternation Condition (see Kiparsky 1982), which had been devised with the same intention. One of the major functions of the Elsewhere Condition and SCC is this prohibition of 'free rides', and a concomitant restriction on the abstractness of underlying representations, especially for non-alternating forms. Constraints such as Structure Preservation will limit the types of rules which may be lexical, again restricting the distance of the underliers from the lexical representation.

These endeavours against abstractness may be further aided by Mohanan's hypothesis that speakers enter words in the mental lexicon in their lexical representations (Mohanan 1982, p.13). More abstract underlying representations of the morphemes involved are optionally acquired later, as the speaker learns related words (Mohanan 1986, p.194). This constraint matches Zwicky's (1974, p.59) guiding principle that "underlying forms should not differ from surface forms without reason"; specifically, this will mean that abstract underliers and derivation by lexical rule will be permitted only where alternations are present, so that again, there will be no free rides. For Zwicky, working in a theory which recognised only two significant levels of representation, this principle could be no more than a stipulation. In LP, however, the introduction of the lexical level provides a basis for computing the abstractness of underlying representations, which will be equivalent to the lexical representations except in the case of alternating forms.

2. Psychological reality

Gordon (1985) suggests that morphological level-ordering constrains the child's acquisition of word-formation rules, and may be "an innate structural property of the lexicon" (p.1). Further claims are made for the psychological reality of the phonological component of LP, notably by Mohanan (1982, 1986). Mohanan concentrates on the lexical level; as we have seen, he considers this to be the level of representation in which words are, at least initially, stored in the mental lexicon. He also argues that many of the psychologically relevant properties of the classical phonemic level converge on the lexical level in LP; for instance, speaker judgments on sameness and difference of sounds depend on this level, as do speech errors and secret code languages which permute segments. Mohanan in fact identifies the lexical representation as "what a speaker of the language thinks he is saying or hearing" (1986, p.194), a clear claim for psychological reality.

Even if this evidence for psychological relevance relates mainly to the lexical level, the constraints discussed in 1. above should prevent the underlying representations from being entirely psychologically unreal. In fact, given Mohanan's view that words are stored in their lexical representations in the absence of alternations, the two levels will frequently be identical: speakers may learn to segment words into morphemes, but, in the absence of alternating forms, will enter these morphemes at the underlying level with a representation equivalent to their lexical representation.

3. Internal and external evidence

Standard Generative Phonological analyses are motivated solely by internal evidence relating to distribution and alternation, and perform badly when confronted with external evidence such as speaker judgments, speech errors, and (as we shall see below) dialect differences and diachronic change. The main aim of the SPE model is to provide, for a given dialect at a given time, a maximally simple and general phonological description. If the capturing of as many generalisations as possible is seen as paramount, and if synchronic phonology is an autonomous discipline, then, the argument goes, internal, synchronic data should be accorded primacy in constructing synchronic derivations. And purely internal, synchronic data favour abstract analyses since these apparently capture more generalisations.

However, this assumption is refuted by Mohanan (1986, p.184), who argues that both internal and external evidence are crucial in evaluating a phonological theory, "without implying any priority of one kind of evidence over the other". The over-reliance of SGP on purely internal evidence reduces the scope for its validation, and detracts from its psychological reality. Mohanan therefore asserts (1986, p.185) that:

"linguistic theory ... is committed to accounting for evidence from all sources. The greater the range of the evidence types that a theory is capable of handling satisfactorily, the greater the likelihood of its being a 'true' theory."

I propose, then, to widen the range of evidence to which LP should be answerable to include not only synchronic, dialect-internal data, but also diachronic evidence; the facts of related dialects; speech errors; and speaker judgments, either direct or as reflected in the results of psycholinguistic tests. If LP is to be regarded as a sound and explanatory theory, its predictions must consistently account for, and be supported by, evidence from a range of these areas.

The claims outlined above engender a view of LP as a non-abstract, psychologically relevant theory consistent with internal and external evidence. Recent publications demonstrate that such a view is utopian, and that these claims are largely unvalidated. Moreover, these ideals are unlikely to be achieved until proponents of LP have the courage to reject tenets and mechanisms of SGP which are at odds with the anti-abstractness aims of lexicalism. For instance, although Mohanan (1982, 1986) is keen to stress the relevance of external evidence, he is forced to admit (1986, p.185) that his own version of the theory is based almost uniquely on internal data. Much credence is given (see Kiparsky 1982, Mohanan 1986, and especially Halle and Mohanan 1985) to considerations of elegance, maximal generality and economy; and the simplicity metric of SGP still seems paramount in determining the adequacy of phonological analyses. The tension between these relics of the SPE model and the constraints of LP is at its clearest in Halle and Mohanan (1985), the most detailed lexicalist formulation of English segmental phonology currently available. The Halle - Mohanan model, which will be the focus of much criticism in the chapters below, represents a return to the abstract underlying representations and complex derivations first advocated by Chomsky and Halle. Both the model itself, with its proliferation of lexical levels and random interspersal of cyclic and non-cyclic strata, and the analyses it produces, involving free rides, minor rules and the full apparatus of SPE phonology, are unconstrained.

Despite this setback, my contention is that we need not choose either to reject derivational phonology outright, or to accept that any rule-based phonology must necessarily and inevitably suffer from the theoretical problems which afflicted the SPE model. We have a third choice; we can re-examine problems which proved irresolvable in SGP, to see whether they may be more tractable in LP. However, the successful application of this strategy requires that we should not cling too tightly to the apparatus of SPE: if the ideals of LP are to be achieved, we may not simply state its principles and constraints, but must rigorously apply them. And we must be ready to accept the result as the legitimate output of such a constrained phonology, although it may look profoundly different from the phonological ideal bequeathed to us by the expectations of SGP.

In this thesis, I shall examine the performance of LP in three areas of phonological theory which were mishandled in SGP, and which are therefore also problems for LP, as a descendent of this model. If LP, suitably revised and constrained, cannot cope with these areas adequately, it is evidently not equal to the strong claims made by Mohanan and others which I cited above. If, however, insightful solutions can be provided, LP will no longer be open to many of the criticisms levelled at SGP, and will emerge as a partially validated phonological theory and a promising locus for further research.

Of the three areas of investigation I have selected, one is internal, and the others are at least partially external. The first is the problem of abstractness, which, as noted above, is apparent in some recent lexicalist work (see Halle and Mohanan 1985); the others are the differentiation of related dialects, and the relationship of synchronic phonological rules and diachronic sound changes. Let us first assess why the legacy of SGP in these areas is so unenviable.

1. Abstractness

Considerations of space prevent me from rehearsing fully the arguments of the abstractness controversy; my comments will therefore be general and brief, and in any case, numerous examples of abstract analyses will be considered in the chapters which follow.

SGP has at its centre the notion that the native speaker will construct the simplest possible grammar to account for the primary linguistic data he or she receives, and that the linguist's grammar should mirror the speaker's grammar. The generative evaluation measure for grammars therefore concentrates on relative simplicity, where simplicity subsumes notions of economy and generality. Thus, a phonological rule is more highly valued, and contributes less to the overall complexity of the grammar, if it operates in a large number of forms and is exceptionless.

There are two consequences of this drive for simplicity and generality. First, exceptions were rarely stated as such in SGP; instead, they were removed from the scope of the relevant rule, either by altering their underlying representations, or by applying some 'lay-by' rule and a later readjustment process. Second, rules which might be well-motivated in alternating forms are made applicable also in isolated, non-alternating words, which again have their underlying forms altered and are given a 'free ride' through the rule. By employing strategies like these, a rule like Trisyllabic Laxing in English was made applicable not only to forms like *divinity* (- *divine*) and *declarative* (- *declare*), but also to *camera* and *enemy*; these would have initial tense vowels in their underlying representations, and undergo Trisyllabic Laxing to provide the required surface lax vowels. Likewise, an exceptional form like *nightingale* is not marked [- Trisyllabic Laxing], but is instead stored as /nIxtVngǣl/; the voiceless velar fricative is later lost, with compensatory lengthening of the preceding vowel, to give the required long, tense vowel on the surface.

It is clear that the distance of underlying representations from surface forms is entirely unconstrained in SGP, being controlled only by the simplicity metric, which positively encourages abstractness. Furthermore, there is no reference point midway between the underlying and surface levels, due to the SGP rejection of the phonemic level. Consequently, as Kiparsky (1982, p.34) says, SGP underlying representations

> "will be at *least* as abstract as the classical phonemic level. But they will be more abstract whenever, and to whatever extent, the simplicity of the system requires it."

This excessive distance of underliers from surface forms raises questions of learnability, since it is unclear how a child might acquire the appropriate underlying representation for a non-alternating form. Indeed, the strategies employed are motivated solely by the desire for simplicity in analysing internal data, and are entirely unsupported by external evidence.

A further charge is that of historical recapitulation: Crothers (1971) accepts that maximally general rules do reveal patterns in linguistic structure, but argues that these generalisations are non-synchronic. If we, like SPE, rely solely on internal evidence and on vague notions of simplicity and elegance to evaluate proposed descriptions, we are in effect performing internal reconstruction of the type used to infer an earlier, unattested stage of a language from synchronic data: we are, that is, doing historical linguistics. Thus, Lightner (1971) relates *heart* to *cardiac* and *father* to *paternal* by reconstructing Grimm's Law, while Chomsky and Halle's account of the *divine* - *divinity* and *serene* - *serenity* alternations involves the historical Great Vowel Shift (minimally altered and relabelled as simply the Vowel Shift Rule to forestall confusion with its historical counterpart) and the dubious assertion that native speakers of Modern English still internalise the Middle English vowel system. In an abstract generative phonology, the underlying representations and 'synchronic' rules reflect the historical development of the language; and a phonology composed entirely of historical processes cannot be a valid synchronic phonology.

2. Dialects

The classical SGP approach to the differentiation of related dialects rests on an assumption of identity. In generative theory, dialects of one language share the same underlying representations; the differences rest in the form, ordering and/or inventory of their phonological rules (King 1969, Newton 1972). Different languages will additionally differ with respect to their underlying representations. The main controversy in generative dialectology relates to whether one of the dialects should supply underlying representations for the language as a whole, or whether these representations are intermediate or neutral between the realisations of the dialects. Thomas (1967, p.190), in a study of Welsh, claims that "basal forms are *dialectologically mixed*: their total set is not uniquely associated with any total set of occurring dialect forms." Brown (1972), however, claims that considerations of simplicity compel her to derive southern dialect forms of Lumasaaba from northern ones.

I believe that the very basis of generative dialectology, the requirement of a common set of underlying forms, should be rejected by LP. There are several reasons for this reversal of generative practice, which I shall now consider.

First, the derivation of related dialects from a single set of underlying representations entails the notion that the dialect variation involved results from changes in a language which was formerly without variation. This attitude is sometimes made explicit, as it is by Newton (1972, p.1), who considers the dialects of Modern Greek to be "the outcome of historical changes acting on an originally uniform language." This claim of prehistoic uniformity is simply untenable. No known extant language is without variation, and documentary evidence from previous stages of present-day languages also shows signs of diatopic variation; thus, we know of the existence of Kentish, Mercian, West Saxon and Northumbrian dialects of Old English. Not even reconstructed languages like Proto-Indo-European are entirely homogeneous; as Hock (1986, p.569) observes, "isoglosses for ... different changes intersect in such a criss-crossing fashion as to suggest a single, dialectally highly diversified proto-language." At least one of the assumptions of this approach, then, is clearly invalid.

A further objection is that the definition of related dialects as sharing the same underlying forms, but of different languages as differing at this level, prevents us from seeing dialect and language variation as the continuum which sociolinguistic investigation has shown it to be. Furthermore, the family tree model of historical linguistics (Hock 1986, Southworth 1964) is based on the premise that dialects may diverge across time and become distinct languages, but this pattern is obscured by the contention that related dialects are not permitted to differ at the underlying level, while related languages characteristically do. It is not at all clear what conditions might sanction the sudden leap from a situation where two varieties share the same underlying forms and differ in their rule systems, to a revised state involving differences at all levels.

Finally, the status of the basal forms of generative dialectology is unclear. Certainly, these show that the dialects derived from them may be related, but the standing of the common forms themselves, especially if they are neutral between dialects, is ambiguous. Brown (1972) produces two highly relevant disclaimers. First, she notes that

> "it is not suggested that the model of Common Lumasaaba phonology outlined here bears any relation to the process of language acquisition or production for any speaker of any dialect of Lumasaaba" (p.147).

A little later, she adds that

> "I do not suggest that the southern dialects derive historically from any existing northern dialects, nor that the presentation [here] provides a reasonable framework for a synchronic description of any one of the southern dialects. My intention is simply to demonstrate that the dialects can be shown to be related to each other by a small number of quite general rules" (p.171).

This aim is rather unambitious, given the power of the SGP machinery; however, it can certainly be met. But the validity of a basal level which is avowedly synchronically, diachronically and psychologically inadequate or even irrelevant must surely be called into question.

If the points above are taken into account (not to mention the practical enormity of the task of finding basal representations for all the forms of English, for instance), the only solution is to abandon the requirement that related dialects should have common underlying forms. Chambers and Trudgill (1980) agree in principle with this conclusion, although they argue that "unless differences in lexical entries are constrained in some way, it does mean that it would in theory be possible ... to incorporate totally unrelated varieties such as English and Chinese into the same system" (p.50).

I do not believe that this possibility is problematic; if different dialects are to become different languages across time, there should be a continuum between dialect and language variation, and distantly related languages may therefore show residual similarities in their grammars. However, it will still in general be clear whether we are dealing with closely related, distantly related or unrelated varieties. It is interesting that practitioners of comparative reconstruction face an equivalent problem, but that decisions on the applicability of the comparative method can generally be reached without attempting to apply it to inappropriate combinations of languages. The loss of a linguistic definition of dialect may also be a minor problem, given that language and dialect may be more fruitfully regarded as sociopolitical, rather than linguistic notions. Furthermore, Chambers and Trudgill forbear to note that, given the unconstrained nature of SGP, Chinese and English could quite readily have been assigned common underlying forms and designated as related dialects, had Chomsky and Halle been so inclined.

3. Synchrony and diachrony

A central area of debate for phonologists whose interests span the synchronic and diachronic domains is the question of how sound changes are integrated into the synchronic grammar, becoming phonological rules. In SGP, the relationship of sound changes and synchronic phonological rules was inadequately explored.

In the SGP theory of historical linguistics (Halle 1962, Postal 1968, King 1969), it is assumed that a sound change, once implemented, is inserted as a phonological rule at the end of the native speaker's rule system; it then moves gradually higher in the grammar as subsequent sound changes become the final rule. This process of rule addition, or innovation, is the main mechanism by which the results of change are introduced into the synchronic grammar, although there are also occasional cases of rule loss or rule inversion (Vennemann 1972).

SGP, then, is an essentially static model. The assumption is that underlying representations will generally remain the same across time, while a cross-section of the synchronic rule system will approximately match the history of the language: as Halle (1962, p.66) says, "the order of rules established by purely synchronic considerations - i.e., simplicity - will mirror properly the relative chronology of the rules." The problem of historical recapitulation, which makes the synchronic nature of the phonological system questionable, has already been raised under abstractness above. Moreover, SGP is unilluminating on the relationship between sound changes and phonological rules; the only discernible generalisations are that a sound change and the synchronic rule it is converted to will tend to be identical (or at least very markedly similar) in formulation, and that the 'highest' rules in the grammar will usually correspond to the oldest changes. SGP certainly provides no means of incorporating recent discoveries on sound change in progress, such as the division of diffusing from non-diffusing changes (Labov 1981).

It is true that some limited provision is made in SGP for the restructuring of underlying representations, since it is assumed that children will learn the optimal, or simplest grammar. This may not be identical to the grammar of the previous generation, since adults may only add rules, but the child may construct a simpler grammar without this rule but with its effects encoded in the underlying representations. However, this facility for restructuring is generally not fully exploited, and the effect on the underliers is in any case felt to be minimal; thus, Chomsky and Halle (1968, p.49) can confidently state:

> "It is a widely confirmed empirical fact that underlying representations are fairly resistant to historical change, which tends, by and large, to involve late phonetic rules. If this is true, then the same system of representation for underlying forms will be found over long stretches of space and time."

This evidence on diachronic matters matches our earlier findings on the differentiation of dialects, and indicates that, in SGP, underlying representations are seen as diachronically and diatopically static. Similar questions are again raised: for instance, how can languages and dialects ever diverge? Are the underlying representations of Modern French identical to those appropriate to Latin, or to Proto-Indo-European, or even Proto-Nostratic (Bomhard 1984) or 'Proto-World'? Even if no linguist would take these extremes seriously, the unconstrained power of SGP means that such analyses cannot, in principle, be outlawed.

The three areas outlined above are all dealt with unsatisfactorily in SGP; moreover, these deficiencies can be shown to be linked, and to be due in all cases, directly or indirectly, to the insistence of proponents of the SPE model on a maximally simple, exceptionless phonology. The use of an evaluation measure based on simplicity, the lack of a level of representation corresponding to the classical phonemic level, and the dearth of constraints on the distance of underlying from surface representations all encourage abstractness. Changes in the rule system are generally preferred, in such a system, to changes in the underlying forms, which are dialectally and diachronically static. Rules simply build up as sound changes take effect, with no clear way of encoding profound, representational consequences of change, no means of determining when the underliers should be altered, and no link between sound changes and phonological rules save their identity of formulation. This historical recapitulation contributes to further abstractness, and means that, in effect, related dialects must share common underlying forms. King (1969, p.102) explicitly states that external evidence, whether historical or from related dialects, may play no part in the evaluation of synchronic grammars; this is said to be a principled exclusion, reflecting the fact that speakers have no access to the history of their language or to the facts of related varieties, but is equally likely to be based on the clear inadequacies of SGP when faced with data beyond the synchronic, internal domain.

I hope to show in the following chapters that LP does not necessarily share these deficiencies, and that its successes in the above areas are also linked. Working with three reference accents of Modern English, I shall demonstrate that the rigorous exploitation of the principles and constraints of LP described above significantly restricts the abstractness of the synchronic phonology. If the synchronic model is less abstract, we will be unable to consistently derive related dialects from the same underlying representations, and the underliers will also be subject to change across time. Sound changes and related phonological rules will frequently differ in their formulation, and new links between diachrony and synchrony will be revealed.

In Chapter 2, I shall appraise the lexical model of Modern English morphology and phonology proposed by Halle and Mohanan (1985), highlighting the abstract and unconstrained nature of this version of LP and arguing for a restriction of the model to two lexical levels. The appropriateness of the resulting framework for the RP and General American accents will be discussed. Further invocation of the Strict Cycle Condition and other constraints in Chapter 3 will lead to a reanalysis of certain central rules of the English vowel phonology, including the Vowel Shift Rule and j-Insertion. In Chapter 4, I shall introduce a third reference accent, Scottish Standard English, to evaluate the differentiation of related accents and dialects in LP, and a synchronic and diachronic outline of SSE and non-standard Scots dialects will be given. In Chapter 5, I shall concentrate on the synchronic description of Scottish Standard English, and especially on the formulation of one particular rule, the Scottish Vowel Length Rule, and its consequences for dialect differentiation. The diachronic dimension of LP will be the focus of Chapter 6, in which I shall argue that the Scottish Vowel Length Rule is derived diachronically from a pan-English postlexical process, which has been partially lexicalised in Scots. I shall consider the transference of rules from the postlexical to the lexical component, and argue that postlexical and lexical rules are synchronic analogues of Neogrammarian and diffusing sound changes respectively. Chapter 7 will contain a brief account of my conclusions.

Chapter 2

Constraining the Model: A Revision of Halle and Mohanan's Version of Lexical Phonology

1. Introduction

The most extensive and comprehensive lexicalist account of English vowel phonology currently available is Halle and Mohanan (1985), and my attempts in this Chapter to constrain the framework and mechanisms of LP will focus on this version of the theory. The critique developed here is applicable also to Mohanan (1986), which shares many of the assumptions of Halle and Mohanan (1985). As noted in Chapter 1 above, the Halle-Mohanan model (henceforth HM) comprises four lexical strata, as against Kiparsky's (1982) three and Booij and Rubach's (1987) two, as well as one postlexical level. Arguments for and against HM's four-stratum model, including the controversy over the sensitivity of phonological rules to morphological bracketing alluded to in Chapter 1, will be considered in Section 2 below, where I shall demonstrate that a two-stratum model is adequate for the description of modern English.

HM are primarily concerned with the General American dialect, although they claim that the underlying vowel system they propose (see (1) below) is also appropriate for RP.

(1) short

/ɪ/	bit	/ɨ/	venue	/ʊ/	put
/ɛ/	bet	/ʌ/	but	/o/	baud, shot
/æ/	bat	/a/	balm	/ɔ/	bomb

long

/ī/	divine	/ɨ̄/	profound	/ō/	pool
/ē/	serene	/ʌ̄/	cube	/ɔ̄/	verbose
/ǣ/	sane				

As we saw in Chapter 1, this assignment of a single underlying phonological system to related dialects was a characteristic of SGP which HM carry over into LP. In Sections 3 and 4 below, I shall consider the implications which the two-level lexical model and the constraints of LP have for HM's accounts of two areas of English phonology, namely the treatment of low vowels and the associated generation of surface diphthongs, and the derivation of the [jū] sequence (HM's [yūw]) found in *reduce, assume*. I shall argue that the vowel system of (1) cannot be maintained, and that more concrete inventories, with the possibility of variation between accents, must be proposed. I shall also show that the more surface-oriented analyses of low vowels and diphthongs and of /j/-insertion proposed here are consistent with external as well as internal evidence.

2. Stratification

2.1. Introduction

One major problem for Lexical Phonology has been the proliferation of lexical levels, as evidenced especially in recent analyses of English like HM (1985). If the number of levels proposed for a language is in principle unbounded, the theory loses any claim to explanatory adequacy, since an analysis would be possible in which each word-formation rule or phonological process were assigned to a separate stratum, or every rule to every stratum. However, as noted in Chapter 1 above, Booij and Rubach (1987) advocate a restrictive, principled division of the English lexicon into two levels, the first cyclic and the second non-cyclic (2).

(2)

LEVEL 1:	Class I derivation, irregular inflection Cyclic phonological rules
LEVEL 2:	Class II derivation, compounding, regular inflection Postcyclic phonological rules

In addition, there will be a set of postlexical phonological rules, which will be ordered after the syntactic component. This model of lexical organisation is not said to be specific to English, but is claimed to be readily generalisable to other languages, including Dutch and Polish, and may even be universal, although further investigation is clearly required. However, languages may vary along certain parameters; for instance, English has both morphological and phonological rules on Level 2, whereas Dutch and Polish seem to require all word-formation rules to be ordered on cyclic Level 1. Such limited cross-linguistic variation can easily be accommodated within the revised model.

It is clear that such a principled limitation of the number of strata proposed for English, and indeed for other languages, is desirable. However, HM (1985) have produced data which, they claim, necessitate the four-way division of the lexicon shown in (3).

(3)

LEVEL 1:	Class I derivation, irregular inflection Stress, Trisyllabic Shortening...
LEVEL 2:	Class II derivation Vowel Shift, Velar Softening...
LEVEL 3:	Compounding Stem-Final Lengthening and Tensing
LEVEL 4:	Regular inflection /l/-Resyllabification

The questions I shall address here are these: in view of the evidence from HM, can a reduction to two lexical levels be achieved? And, if so, how can the facts HM use to support their model be reconciled with the revised framework?

2.2. Summary of the Arguments for More than Two Lexical Levels

The arguments presented by HM (1985) and Mohanan (1986) fall into two groups:

1. The supposed cyclicity of strata 1, 3 and 4 in English, as against non-cyclic stratum 2.
2. The existence of various phonological rules which appear to require a four-stratum lexicon to ensure correct application. These rules are Stem-Final Lengthening, Stem-Final Tensing, Sonorant Resyllabification and /l/-Resyllabification.

I shall discuss these points in turn below, and show that each is amenable to reinterpretation or reanalysis. However, it should first be noted that the evidence for more than two lexical levels is exclusively phonological, already a tacit admission of defeat in a supposedly integrational theory with the aim of establishing parallels and connections between morphology and phonology. Morphological evidence for a division of Class I from Class II derivational affixes is very strong (Siegel 1974, Allen 1980), but similar evidence for a division of Class II derivation, compounding and regular inflection is at best tenuous and at worst non-existent.

Kiparsky (1982) classed compounding and Class II derivation together as Level 2 phenomena, on the grounds that each could provide input to the other process (see (4)).

(4)

[[[[neighbour]hood]][gang]]
= affixation ---> compounding

[re[[air][condition]]]
= compounding ---> affixation

This mutual feeding relationship is recognised by HM who, however, wish to differentiate Strata 2 and 3 for phonological reasons (see Section 2.4. below). They consequently propose that Class II derivation takes place on Stratum 2 and compounding on Stratum 3, but introduce a device, the Loop, which "allows a stratum distinction for the purposes of phonology, without imposing a corresponding distinction in morphological distribution" (HM 1985, p.64). Thus, compounds may be looped back into the Level 2 morphology to acquire Class II affixes: Level 2 and 3 phonological rules are differentiated, while Level 2 and 3 morphological processes effectively are not.

The separation of compounding from regular inflection (Level 2 versus 3 in Kiparsky 1982, 3 versus 4 in HM) was originally justified by the assumption that inflections like plural /S/ appear only 'outside' compounds, i.e. on the final stem, as shown in (5).

(5) *motorsway service station
*motorways service station
*motorway services station
motorway service stations

However, it is now clear that this assumption was mistaken: the plural inflection must be allowed to appear 'inside' compounds (6), albeit under limited circumstances (Sproat 1985).

(6)

systems analyst	human subjects committee
ratings book	parts department

Sproat proposes that compounding and inflection should occupy a single stratum, and that a constraint can characterise those cases in which the left-hand stem of a compound may be inflected: "The left member of a compound must be unmarked for number, unless the plural is interpreted collectively or idiosyncratically" (Sproat 1985).

Since compounding and Class II derivation must be allowed to be interspersed, and since compounding and regular inflection also interact, there seems to be no morphological motivation for a Stratum 2 versus 3 versus 4 distinction for English. If compounding, inflection and Class II derivation are to share a single stratum, however, one difficulty remains: how are regular inflections to be restricted to word-final position, with no Class II derivational suffixes attaching to their right?

Borowsky (1986, p.254) notes that sequences of regular inflection plus Class II suffix may, in fact, be permissible in certain forms, like *yearningly* and *lovingly*; these could be generated in HM's model only by proposing a second loop, this time from Level 4 to Level 2. In cases where a restriction on the position of regular inflections within the word is operative, as in the examples involving the plural suffix in (7), appropriate sequencing constraints would have to be formulated.

(7)	*hopesful	hopefuls
	*weaksness	weaknesses

Such constraints will be independently necessary in any case, since certain Class II derivational affixes do not appear outside others, as shown in (8). Consequently, the solution need not lie in a stratal distinction.

(8)	*-nessful	*wearinessful	*happinessful

I shall now discuss the various arguments used by HM (1985) and Mohanan (1986) to motivate the four-stratum phonological organisation they propose for the English lexicon.

2.3. The Cyclicity Argument

Gleaning information from HM on the cyclicity of the various lexical levels they posit for English can be a trying task. Stratum 1 is clearly cyclic, like the initial level in other lexical phonologies of English (Kiparsky 1982, 1985; Booij and Rubach 1987); some evidence for this is that the stress rules, which are situated on Level 1, are generally agreed to operate cyclically, and that rules like Trisyllabic Laxing/ Shortening clearly obey the Strict Cyclicity Condition (SCC; Kiparsky 1982, Mascaró 1976), and must therefore be cyclic. While Kiparsky (1982) proposed SCC as a constraint on cyclic rules, HM assume that cyclicity is a property of strata, so that rules with a domain of more than one lexical stratum may apply cyclically on a cyclic level and non-cyclically elsewhere: HM reformulate SCC as in (9).

(9) Strict Cyclicity Condition:
"Rules applying in a cyclic stratum cannot change environments not derived in their cycle"
(HM 1985, p.97)

In HM's terms, then, Stratum 1 must be cyclic, since rules ordered on that level apply in accordance with SCC.

HM also provide evidence for the non-cyclic nature of Stratum 2. First, they argue that a rule like Stem-Final Tensing (which operates on Stratum 2 in HM's dialects A and B, although it is ordered on Stratum 3 for Dialect C - see Section 2.4.3. below and also HM pp.59-62) would produce the wrong output if applied cyclically. In Dialects A and B, Tensing occurs word-finally, before inflections, stem-finally in compounds, and before Class II derivational affixes, except *-ful* and *-ly*, and the rule HM propose is given in (10). It should be noted that this rule affects only tenseness: HM generally separate lengthening and tensing processes, and regard length as the underlying dichotomising feature in their English vowel system. Tenseness is not present at the underlying level, but is introduced by a redundancy rule during the course of the derivation.

(10) $$\begin{bmatrix}-\text{cons}\\-\text{low}\end{bmatrix} \;\text{---}\!> \; [+\ \text{tense}] \;/\; \_\_\_\,]_{R}$$

except before *-ly*, *-ful*
(HM p.67)

Cyclic operation of Stem-Final Tensing would yield the derivation in (11).

(11)	[hæpI]	[lI]	Underlying
	[hæpī]	[lī]	Tensing
	[[hæpī][lī]]		Affixation
	*[hæpīlī]		Output

(after HM p.67)

If, however, the Tensing rule is allowed to apply only after all Stratum 2 morphology, and thus after the affixation of *-ly*, the correct output, [hæpIlī], will be produced. HM conclude that, since in their view cyclicity is a property of strata and not of individual rules, Stratum 2 must be non-cyclic. The hypothesis that Stratum 2 is non-cyclic for English is supported by the fact that Stratum 2 phonological rules like Velar Softening and Vowel Shift, in their traditional SGP formulations, do not obey the SCC. Vowel Shift, for instance, affects *divine* and *serene*, while Velar Softening applies in *receive* and *oblige*, all non-derived environments.

It is rather more difficult to ascertain the cyclicity or non-cyclicity of HM's Strata 3 and 4. If these levels were cyclic, they could hardly be merged with Stratum 2 to give a single postcyclic level like that suggested by Booij and Rubach (1987). HM do state that "stratum 2, unlike strata 1 and 3, is a non-cyclic stratum" (p.96); however, they produce no arguments for the cyclicity of Stratum 3, and do not even broach the subject with regard to Stratum 4. In fact, the only reason we have for assuming that HM regard Strata 3 and 4 as cyclic is their remark that "given that at least some strata have to be cyclic, the null hypothesis would be that all lexical strata in all languages are cyclic" (HM, p.67); thus, evidence must be produced to establish the non-cyclic nature of a stratum, but not to establish that it is cyclic. Cyclicity is the default value for lexical strata.

It is clear that the assumption that Strata 3 and 4 are cyclic is open to question. For instance, Mohanan and Mohanan (1984), while claiming that "abundant evidence" (p.593), which they do not cite, exists for the cyclic application of rules on Levels 1 and 3, believe that "there is no need to assume that the rule applications in stratum 2...and stratum 4...are cyclic" (p.593). In fact, there are good reasons to assume that neither Stratum 3 nor Stratum 4 is cyclic.

Whereas a large number of English phonological rules seem to apply on Levels 1 and 2 (see HM 1985, p.100), HM order only one rule, /l/-Resyllabification, on Level 4, and only two, Stem-Final Tensing (Dialect C) and Stem-Final Lengthening (Dialect B) on Level 3. It is on the basis of these three rules that HM motivate the Stratum 2 versus 3 versus 4 distinction for English, as we shall see in 2.4. below. We shall discuss the validity of these rules, and the possibility of reanalysing them, later. For the moment, we need only establish that Levels 3 and 4 are non-cyclic to remove one argument against the incorporation of HM's Strata 2-4 into a single postcyclic or word-level stratum, as proposed by Booij and Rubach (1987).

There is certainly no evidence for cyclic application of /l/-Resyllabification, the sole Stratum 4 phonological rule in HM's model. We have already seen that Mohanan and Mohanan (1984) consider Stratum 4 to be non-cyclic, and although HM do assert that Stratum 3 is cyclic, they present no evidence for this. In fact, an analogue of Stem-Final Tensing, Vowel Tensing, applies on non-cyclic Level 2 in HM's Dialects A and B, without the discrepancies in operation that might be expected due to cyclic application in some dialects and non-cyclic operation in others. There is, however, a stronger objection to the hypothesis that Stem-Final Tensing applies cyclically: the rule violates the SCC, which HM regard as a constraint on all cyclic strata (see (9) above). Stem-Final Tensing applies to such forms as *city* and *happy*, which are underived and will have undergone no previous processes on the same cycle as the Tensing rule. The same reasoning holds for Stem-Final Lengthening: if Stem-Final Tensing, which feeds the Lengthening rule, were cyclic, then it could create derived environments on the same cycle as Lengthening, which could then apply in *city, happy*. However, we have already established that Tensing is non-cyclic, so that it may not apply on Stratum 3 if this is a cyclic level. In that case, Stem-Final Lengthening also violates SCC, and consequently cannot be cyclic.

There is, then, little or no motivation for regarding Strata 3 and 4 in English as cyclic. If these later levels are non-cyclic, one obstacle to their incorporation, with the existing Stratum 2, into a single postcyclic component is removed. Further evidence in favour of this type of lexical organisation is provided by Giegerich's (1988) attempt to derive the effects of the SCC from the Elsewhere Condition using Root --> Word rules, which assign lexical category labels to unbound roots (see Chapter 1). The domain of these rules can only be Stratum 1, since roots are confined to this level. It follows that SCC can be operative only at this initial cyclic stratum.

However, some problems remain before we can accept a two-stratum lexicon. Although the phonological rules which HM assign to Strata 3 and 4 clearly cannot be differentiated from Stratum 2 rules on the basis of their mode of application, since we have established that they are non-cyclic, these rules might still necessitate a separation of Strata 2, 3 and 4, all NON-cyclic, if they are to apply correctly. I shall now examine this possibility.

2.4. Phonological Rules Requiring a Stratal Distinction

HM (1985) and Mohanan (1986) argue that a three-way split of Strata 2, 3 and 4 is necessary since otherwise certain phonological rules will be unable to produce the required output. These rules are Sonorant Resyllabification, /l/-Resyllabification, Stem-Final Tensing (Dialect C), and Stem-Final Lengthening (Dialect B).

2.4.1. Sonorant Resyllabification

The following alternations (12), involving syllabic and non-syllabic /l m r/, may be observed in English.

(12)	cylinder	[sIlIndr̩]	cylindrical	[sIlIndrIkl̩]
	prism	[prIzm̩]	prismatic	[prIzmætIk]
	simple	[sImpl̩]	simply	[sImpli]
	twinkle	[twIŋkl̩]	twinkling (N)	[twIŋklIŋ]

The generalisation behind these data is the following:

"In all dialects of English, a syllabic consonant becomes nonsyllabic when followed by a vowel-initial derivational suffix, whether it is class 1 or class 2" (Mohanan 1986, p.32).

Mohanan assumes that the rules of syllable formation apply to all derived forms at Strata 1 and 2, producing the syllabifications found in the data of (12). However, sonorants are not resyllabified across the stems of compounds (13).

(13) double edged [dʌbl̩ɛdʒd]

Mohanan therefore proposes that Stratum 3 (compounding) should be distinguished from Stratum 2 (Class II derivation), and that syllable formation should not reapply at Stratum 3.

However, sonorants may resyllabify before vowel-initial inflectional suffixes, as shown in (14).

(14) doubling [dʌblIŋ] or [dʌbl̩Iŋ]
twinkling [twIŋklIŋ] or [twIŋkl̩Iŋ]

Stratum 4 (regular inflection) must therefore be kept separate from Stratum 3 (compounding). Mohanan cannot account for this resyllabification by invoking the syllable formation rules, since these are inapplicable at Stratum 3 and "the domain of a rule may not contain nonadjacent strata" (Mohanan 1986, p.47). Mohanan must therefore introduce another rule, given in (15).

(15) Sonorant Resyllabification
(domain: Stratum 4. Optional)

$$V \longrightarrow C \,/\, \underset{[+\text{ cons}]}{\underline{\quad}} \;]\; V$$

Apart from the undesirable duplication caused in the grammar by producing the same results via two different types of rule, there are other objections to Mohanan's analysis of the facts of Sonorant Resyllabification. Kiparsky (1985) discusses the same data, but contends that the syllabification facts involving Class II derivational suffixes and inflections are identical:

"*hinder#ing*, *center#ing* are trisyllabic (versus disyllabic level 1 *hindr+ance*, *centr+al*) to exactly the same extent as noun-forming derivational *-ing* and as the present participle suffix (*John's hindering of NP* and *he was hindering NP*)" (Kiparsky 1985, fn.2, p.134-5).

Kiparsky does admit that speakers may contrast disyllabic *crackling* 'pork fat' with optionally trisyllabic *crackle#ing*, but holds that "here again the abstract noun and inflectional *-ing* both work the same way and the disyllabic concrete noun in *-ing* is probably best regarded as an unproductive level 1 derivative" (Kiparsky 1985, fn.2, p.135).

If Kiparsky is correct, and if Sonorant Resyllabification operates equivalently with Class II derivational affixes and regular inflections, the data quoted by Mohanan can be generated in a model of the lexicon with only two strata, and using only one rule. However, this solution depends crucially on the maintenance of a distinction between affixes and stems in terms of brackets, and on the ability of phonological rules to refer to this distinction. In Chapter 1 I simply stated that I would follow Kiparsky (1982), who assumes the structures in (16) for affixed forms and compounds.

(16)	[[...]...]	=	stem plus suffix
	[...[...]]	=	prefix plus stem
	[[...][...]]	=	compound (stem plus stem)

Kiparsky further assumes that double 'back-to-back' brackets,][, block phonological rules unless they are mentioned in the structural description of the rule, although single brackets do not. I shall attempt to justify my position on this issue, and consider objections to Kiparsky's system, in Section 2.5. below.

Let us, for the moment, assume that Kiparsky is correct, and adopt also a two-stratum lexicon. Within such a model, compounds, Class II derivation and regular inflection will be ordered on the postcyclic level, Stratum 2, and in terms of brackets, Class II derived items and inflected words will be classed together as against compounds; these alone will contain double internal brackets. If phonological rules are permitted to refer to bracketing configurations, we would expect them to apply to compounds alone, or to all items derived at Stratum 2, or to both types of affixed items, but not to compounds. Sonorant Resyllabification exhibits the last type of behaviour. This rule will apply at Stratum 2, before vowel-initial derivational and inflectional suffixes; but since the double brackets][will not be specified in its structural description, it will be unable to operate across the stems of compounds.

A revised analysis of Sonorant Resyllabification, then, allows the process to be incorporated into a two-stratum lexical phonology. Its application in affixed items but not in compounds can be explained despite the ordering of compound formation, Class II derivation and regular inflection on the same level.

2.4.2. /l/-Resyllabification

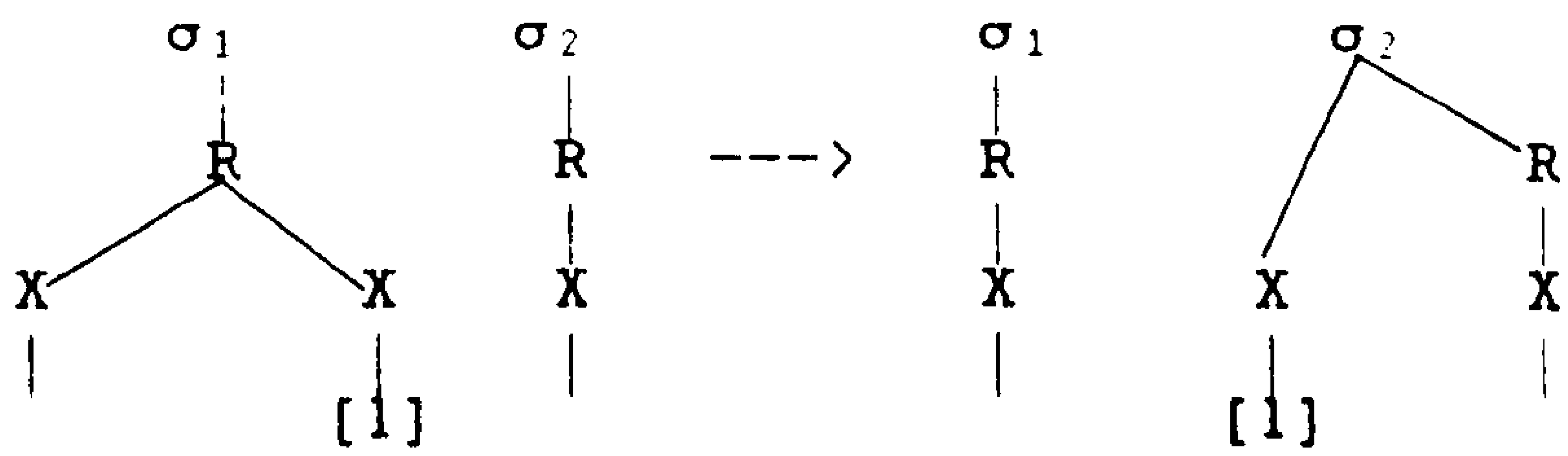
While Sonorant Resyllabification makes syllabic consonants non-syllabic, /l/-Resyllabification has no effect on the number of syllables in a word; it simply moves non-syllabic /l/ from the coda of one syllable into the onset of the next. /l/-Resyllabification and /l/-Velarisation, a postlexical rule which 'darkens' /l/ in syllable rhymes, together govern the distribution of clear (palatalised) and dark (velarised) variants of /l/ in English. /l/-Resyllabification produces clear [l] in onset position, and thus bleeds /l/-Velarisation.

Both HM (1985, pp.65-6) and Mohanan (1986, p.35) state that /l/-Resyllabification operates in compounds and across vowel-initial inflections. /l/ is not resyllabified across words, however (see (17)).

(17)	dealing	mail order	I have to tell Audrey
	[l]	[l]	[ɫ]

The domain of /l/-Resyllabification (18) must therefore be Stratum 4 of the lexicon, in HM's model.

(18) /l/-Resyllabification (domain: Stratum 4)



(after HM 1985, No.21, p.65)

Neither HM (1985) nor Mohanan (1986) say whether /l/-Resyllabification applies before vowel-initial derivational suffixes. However, it seems from informal observations, supported by the data in Bladon and Al-Bamerni (1975), that /l/ is indeed resyllabified before suffixes like those in (19).

(19)	hellish	dealer	scaly
	[l]	[l]	[l]

Booij and Rubach order /l/-Resyllabification on Stratum 2, where Class II derivation, compounding and regular inflection all take place. If /l/-Resyllabification does operate in the context of Class II derivational suffixes, the process will be allowed to apply freely to all Level 2-derived forms, and we can adopt Booij and Rubach's analysis. All phonological motivation for Stratum 4 is thus removed, since the facts of /l/-Resyllabification can be captured in a two-stratum lexical model.

The version of /l/-Resyllabification discussed above is not, however, the only one. Mohanan (1986, p.35) notes that speakers of some British English dialects resyllabify /l/ before any vowel-initial suffix, derivational or inflectional, but not across the stems of compounds or across words, where the /l/ will be dark. Mohanan proposes that speakers of these dialects have a slightly different rule of /l/-Resyllabification, which still applies at Level 4, but which requires the presence of a morphological juncture; this revised formulation is given in (20).

```
(20)  /l/-Resyllabification  (domain:  Stratum 4)

              O                                  R
              |                                  |
  C --->      C     /        ----          ][
                              |
                      [ + lateral]

                          (Mohanan 1986, No. 49, p.35)
```

Given Mohanan's system of bracketing, these double brackets will be present at Stratum 4 in inflected words, but will have been removed medially in compounds by Bracket Erasure at the end of Stratum 3, leaving the representations in (21).

```
(21)   Stratum 3:   [deal]  [ing]       [[mail][order]]
       Stratum 4:   [[deal][ing]]       [mail order]
```

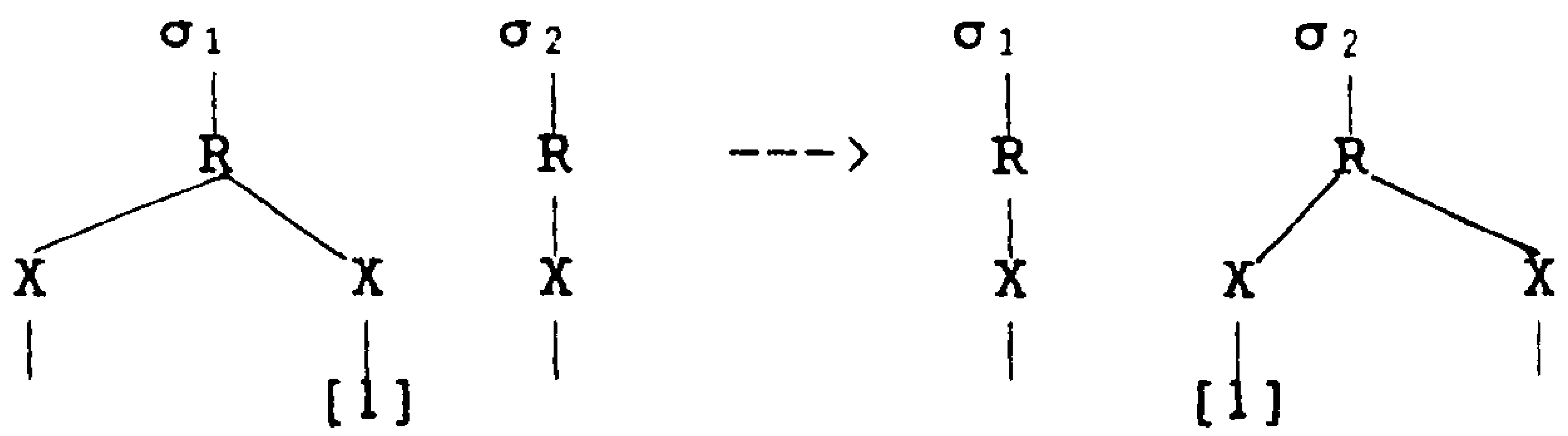
Mohanan's rule certainly prevents /l/-Resyllabification from applying in compounds. However, it will also prevent /l/ from resyllabifying before vowel-initial derivational suffixes, since these are attached prior to Stratum 4 in Mohanan's model and the internal brackets required in the structural description of (20) will have been deleted by Bracket Erasure, as was the case for compounds (22).

```
(22)
Stratum 2:  [[deal][er]]  [mail]  [order]    [deal]  [ing]
Stratum 3:  [dealer]     [[mail][order]]     [deal]  [ing]
Stratum 4:  [dealer]      [mail order]      [[deal][ing]]
```

Since Mohanan (1986, p.35) actually says that /l/ is clear in these dialects before vowel-initial derivational suffixes, this is hardly a desirable situation; and it is hard to see how it is to be resolved using a four-stratum lexicon, without proposing a domain for /l/-Resyllabification consisting of non-adjacent strata.

No such difficulties arise, however, within a two-stratum lexical model, provided that we allow phonological rules to be blocked by morphological bracketing and that compounds are differentiated from affixal formations in terms of bracketing configurations: these requirements were also necessary for the correct application of Sonorant Resyllabification. /l/-Resyllabification will then be a postcyclic, Level 2 rule which will apply in one set of English dialects (the first set discussed above) in all forms derived at Level 2, i.e. in Class II derived, inflected and compound forms. In a second set of (British) English dialects, /l/-Resyllabification (23) will be formulated so as to exploit the difference in morphological structure between derived and inflected forms on one hand and compounds on the other, and will not apply across the double internal brackets of compounds, since these will not be specified in the structural description of the rule.

(23) /l/-Resyllabification (domain: Stratum 2)



2.4.3. Stem-Final Tensing and Lengthening

HM (1985, pp.59-62) use these rules as evidence for the separation of Levels 2 and 3. The facts which Stem-Final Tensing and Lengthening are intended to account for involve the treatment of underlying /l/ in four unidentified dialects (see (24)).

(24)

		Dialect			
		A	B	C	D
word-final:	city	ī	īy	ī	I
before inflections:	cities	ī	īy	ī	I
stem-final in compounds:	city hall	ī	īy	ī	I
before Class II affixes (not -ly, -ful):	happiness	ī	ī	I	I

In Dialect D, stem-final /I/ is never tensed or lengthened. In Dialects A and B, Stem-Final Tensing takes place in all the environments listed above; HM order this rule on Stratum 2 for these dialects. However, /I/ does not tense in Dialect C before Class II derivational suffixes, and similarly, [ī] in Dialect B does not lengthen, or diphthongise, in this environment. Stem-Final Tensing (Dialect C) and Stem-Final Lengthening (Dialect B) cannot apply on Level 2, since they would then produce *[hæpīnɛs] and *[hæpīynɛs]. HM assign these rules instead to Stratum 3, where the appropriate vowel before Class II derivational suffixes will no longer be constituent-final due to Bracket Erasure.

Clearly, Stem-Final Lengthening and Tensing create problems for a two-stratum lexical phonology. In such a model, these rules would be ordered on Level 2, since they are non-cyclic, and would thus be expected to apply in Class II derived forms, inflected words and compounds; or, if sensitive to bracketing differences, in both sets of affixed forms but not compounds; or in compounds alone. However, there is no way, in terms of brackets, to distinguish compounds and inflected forms from words with Class II derivational suffixes.

Although HM take this problem as decisive evidence for the necessity of a Stratum 2 versus 3 distinction in English, the difficulty may not be as insurmountable as it seems. Borowsky (1986, p.250), for instance, questions the motivation for proposing separate rules of Stem-Final Lengthening and Tensing. She notes that HM separate these processes because tensed vowels supposedly need not lengthen; thus *theses*, [θīysīyz], with a long vowel in the final syllable, may contrast with *cities*, [sItīz], in which the second vowel has been tensed but not lengthened. Borowsky attributes this difference instead to "a phonetic difference from the stress" (p.251) - the greater length of the second vowel of *theses* is due to the fact that this word has two stressed syllables, while *cities* has only one. Furthermore, Borowsky challenges HM's assumption that, in their Dialect B, lengthening fails before Class II derivational suffixes, asserting instead that lengthening/tensing will operate in *happiness, city, cities* and *city hall*, but that

"perceptually the length is more salient in absolute word-final position, or preceding tautosyllabic voiced consonants, as in *cities*, where we know there is an independent phonetic lengthening effect" (p.253).

Thus, Borowsky denies that there is any phonological distinction between HM's [ī] and [īy]; any apparent difference is merely phonetic.

Borowsky also dismisses HM's contention that the failure of Stem-Final Tensing in *happiness* in their Dialect C necessitates a stratal distinction between Level 2 (Class II derivation) and Level 3 (compounding). She points out that *-ly* and *-ful* are already exceptions to HM's rule, and suggests that "dialect C is one in which a few more of the level 2 affixes block tensing" (p.252): *-ness* at least must be added to the list, although owing to the lack of information in HM (1985) it is not possible to say whether all Level 2 derivational suffixes behave in this way in Dialect C.

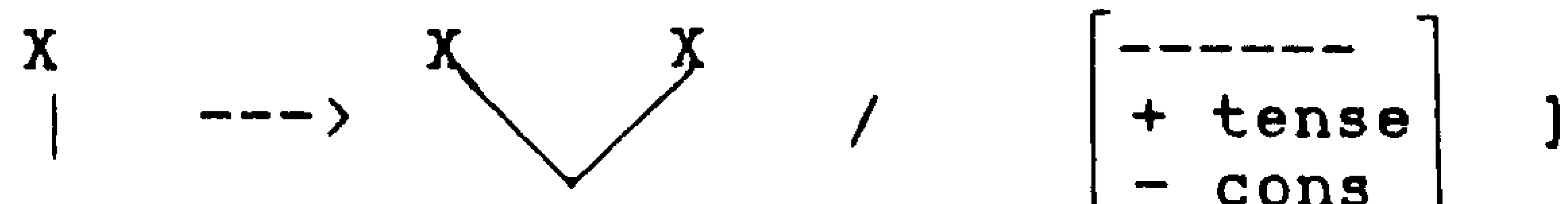
Alternatively, Booij and Rubach (1987, pp.28-9) suggest that HM's Stem-Final Tensing may be reanalysed as Mot-Final Tensing (p.29, No.57), i.e. tensing at the end of the phonological word. At the postcyclic level, *city* and *city hall* will then have /I/ in mot-final position (if we assume that a compound does not count as a single phonological word), whereas /I/ in *happiness* will be ineligible for tensing since *-ness* alone cannot constitute a phonological word. But although this approach correctly excludes *happiness*, it also excludes *cities*. To account for tensing in inflected forms, Booij and Rubach (1987) have to assume that the plural suffix has the underlying form /Iz/, with the /I/ deleted after non-sibilants: /I/ in *cities* will then tense by the Prevocalic Tensing rule needed for *radio, patio*. Similarly, HM's Dialect B will have a Mot-Final Lengthening rule, plus a special Prevocalic Lengthening rule to deal with *cities*.

Booij and Rubach's solution involves what they admit is "an ad hoc rule" (1987, p.29) for Dialect B, a novel representation of the English regular plural suffix, and a reliance on the largely undefined notion of the phonological word. Borowsky's ideas, on the other hand, may involve exception-marking an entire class of suffixes. However, even if we do not accept these particular reinterpretations, the facts of Stem-Final Tensing and Lengthening are clearly amenable to reanalysis. Even if no more appropriate account is currently available, these two rules constitute very meagre justification for a stratal distinction, especially one with such far-reaching consequences: if HM are right, we must accept that the number of strata in a language cannot be restricted in any principled way, and that cyclic and non-cyclic strata may be interspersed.

In addition, HM's data on Stem-Final Lengthening and Tensing are based only on "an informal survey" (1985, p.59); no experimental findings are presented and the four dialects discussed are never identified or localised. It is no wonder that Kaisse and Shaw (1985, p.24) regard the rules involved as "probably subject to alternative explanations or indeed to disagreement over the basic facts."

Finally, HM's account itself suffers from problems and inconsistencies. First, they assign Stem-Final Tensing (Dialect C) and Stem-Final Lengthening (Dialect B) to Stratum 3; these are, in fact, the only two phonological rules to apply on this level. However, as we have already seen (in Section 2.3. above), HM consider Stratum 3 to be cyclic, and since Stem-Final Lengthening and Tensing both violate SCC, they cannot apply on any cyclic stratum in HM's model. Furthermore, HM represent the output of Stem-Final Lengthening in Dialect B as [īy]; however, as a lengthening rule, this process should produce the long monophthong [ii] (see (25)).

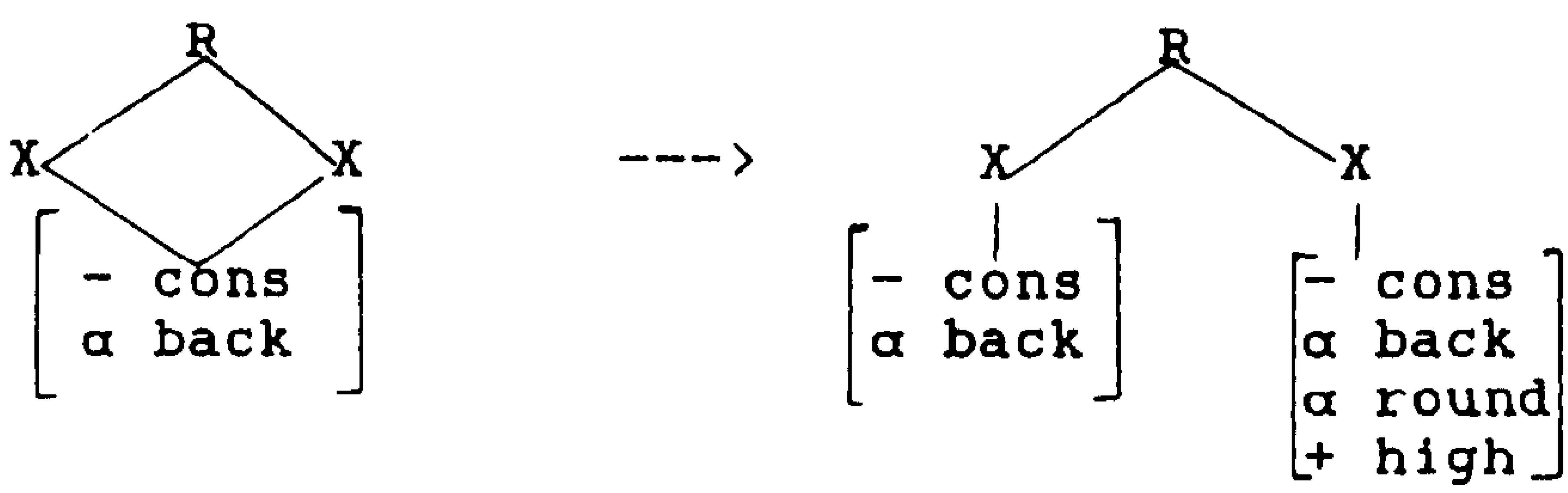
(25)



(HM 1985, No.9, p.61)

The only rule which could then produce [īy] is Diphthongisation (26), which transforms long uniform vowels into vowel plus offglide structures.

(26) Diphthongisation



(HM 1985, No.62, p.79)

However, HM argue that Diphthongisation is a Stratum 2 rule, and since they propose no phonological loop between Levels 2 and 3, it follows that, if Stem-Final Lengthening operates on Level 3, the correct output cannot be derived. If, on the other hand, we assume a two-stratum lexicon, Stem-Final Lengthening can apply on Level 2, feeding Diphthongisation. Alternatively, and perhaps preferably, Diphthongisation could be reformulated as a rule adding an offglide to, or lengthening, tense vowels (as in SPE), rather than dissimilating the second half of a long monophthong to produce an offglide. In that case, Stem-Final Lengthening might be disposed of altogether, to be replaced by Diphthongisation. In dialects without such lengthening, the Stem-Final Tensing rule would be ordered after Diphthongisation on Level 2. The only difficulty here is that Diphthongisation would have to be blocked from applying before Class II derivational suffixes in Dialect B; but since this is a problem common to all the analyses discussed here, and since this solution has various other advantages, I do not consider this a major objection.

2.5. The Use of Morphological Brackets in the Phonology

It seems, then, that evidence adduced by HM and Mohanan (1986) for a four-stratum lexical phonology and morphology of English can be refuted, and that the adoption of a two-stratum lexical model (along the lines of Booij and Rubach 1987) can be recommended. However, certain phonological rules in such a revised model will only apply correctly if compounds and affixed forms are differentiated in terms of brackets, and if the phonology is permitted to refer to these morphological distinctions; this was shown in Section 2.4. above with reference to the proper application of Sonorant Resyllabification and /l/-Resyllabification. I shall now examine some arguments for and against this use of morphological bracketing, with a view to deciding whether it is justifiable.

Kiparsky (1982) assumes the morphological structures for affixed forms and compounds shown in (27).

(27) a. [[...]...]   stem plus suffix
b. [...[...]]   prefix plus stem
c. [[...][...]]   compound (stem plus stem)

He also holds that phonological rules may be sensitive to morphological brackets, in that such brackets may trigger or block rules. However, Mohanan and Mohanan (1984), HM (1985) and Mohanan (1986) all disagree with one or both of these assumptions, arguing that compounds and derived or inflected forms are identical in terms of bracketing, or that, even if there are different bracket configurations, phonological rules may not be blocked by them.

Before proceeding to a discussion of the main arguments for and against Kiparsky's position, we should look briefly at the sources of these competing theories of bracketing. In SGP, including SPE, brackets marking morphosyntactic concatenation were seen as quite separate entities from the phonological boundaries +, # and =, which were units in the segmental string, distinguished from vowels and consonants only by the presence of the specification [- segment] in their distinctive feature matrices. Of the three SPE boundaries, + and # are said to be universal, and are inserted into representations by convention; the formative boundary, +, appears at the beginning and end of each morpheme, while #, the word boundary, borders lexical or higher categories. + and # thus coincide with morphosyntactic brackets. There are also language-specific boundary-weakening processes changing # to +, motivated for instance by inadequacies in the stress rules. The third boundary, =, appears only after the Latinate prefixes *de-, per-, con-, inter-* and so on, and "is introduced by special rules which are part of the derivational morphology of English" (SPE, p.371), again due primarily to wrong predictions made by the stress rules. For instance, Chomsky and Halle represent the verbs *advocate* and *interdict* as [ad=voc+ate] and [inter=dict], and modify the Alternating Stress Rule to operate across = when it appears between the second and third syllables from the end of the word, but not when it separates the penultimate and final syllables.

As for the property of blocking and triggering phonological rules, Chomsky and Halle argue that all boundaries may trigger rules, and that + alone fails to block them, since any string in the structural description of a process which contains no instances of the formative boundary is taken as a schema for other strings identical but for the presence of any number of occurrences of +. Thus, the cycle in SPE operates within domains bounded by #---#, disregarding any intervening +. Chomsky and Halle do not offer much evidence to support this move, although they assert it captures the generalisation that "...processes operating within formatives normally also apply across formative boundary, whereas processes may be restricted to the position where two formatives come together" (SPE, p.364). Furthermore, they do not claim that the formative boundary can never block rules, only that "to express the fact that a process is blocked by the presence of formative boundary, we must resort to certain auxiliary devices...thus adding to the complexity of the grammar" (SPE p.67, fn.10).

The SPE theory of boundaries is clearly quite unconstrained; novel boundaries like = can be introduced on a language-specific basis, and boundaries can be interchanged to forestall problems in the rule system, while no account is taken of the fact that + and # coincide with morphosyntactic concatenation markers. Subsequent developments can be seen largely as attempts to remedy these shortcomings.

Siegel (1974, 1980) reduces the number of permitted boundaries to two, the word and morpheme boundaries. = is replaced by +, on the grounds that:

"the real generalisation governing stress retraction in Latinate-prefixed verbs has nothing to do with the boundary with which the prefix is introduced. Rather, it seems to be the case that stress does not retract off stems in verbs where the stem is the final formative of the verb" (Siegel 1974, p.117).

Siegel correctly predicts that stress retraction will operate in *advocate* but not in *interdict*. Siegel proposes two classes of affixes: Class I, Latinate prefixes and suffixes which may attach to stems or words, affect stress placement, and are introduced with +; and Class II, predominantly Germanic affixes which attach only to words, are stress-neutral (although they may be stress-sensitive) and include # as part of their representation.

Siegel's account involves morphosyntactic brackets as well as phonological boundaries. However, following the introduction of level-ordering by Allen (1978), Strauss (1979) argues against any distinctions among phonological boundaries for English, since the ordering of Class I affixation and the stress rules on Level 1, and of Class II derivation on Level 2, now allows for the different interactions of the two sets of affixes with stress, without reference to word versus morpheme boundary. Strauss equates the single residual boundary with the morphosyntactic bracket. Finally, Strauss accepts Aronoff's (1976) system of bracketing, in which affixes are not independently bracketed, rather than Siegel's, in which affixes and stems are identically delimited by [], on the grounds that, in Aronoff's theory,

"'][' will be unambiguously interpreted as signifying a word-terminal position...With the richer bracketing possibilities of Siegel's system, '][' can be interpreted as a juncture between *any* two formatives" (Strauss 1979, p.395).

Here we see the origin of the divergence of the two current bracketing theories, those of Siegel, Halle and Mohanan and Mohanan versus Aronoff, Strauss and Kiparsky.

Mohanan and Mohanan (1984) accept Kiparsky's proposal that compounds differ from affixed forms morphologically, and that this difference can be encoded using brackets; and they agree that such brackets are preferable to the multiplicity of boundary symbols found in SPE. However, they argue that "morphological brackets may trigger phonological rules, but not block them" (p.578, fn.8): although brackets may be present in the structural description of a rule to cause it to operate,

> "the effect of boundaries 'blocking' phonological rules is achieved by stipulating the domain of the relevant rule to be a stratum prior to the morphological concatenation across which the rule is inapplicable" (p.598).

Mohanan and Mohanan present no evidence or arguments for this assertion that morphological bracketing is only partially accessible to the phonology, and the same is true of HM (1985). HM do not distinguish compounds from affixed forms, proposing the structure [[...][...]] for both, but their only justification for dropping Kiparsky's distinction is that they "see no reason to distinguish between compounding and affixation in terms of bracketing" (HM 1980, p.60, fn.4). Halle and Mohanan's separation of Strata 2, 3 and 4 for English is a reminder that they do indeed see reason for such a distinction, albeit differently encoded.

Mohanan (1986), who, like HM, uses the same bracketing for compounds and derived or inflected forms, provides the only real arguments against Kiparsky's/Strauss's proposal; but even these are not strong. Mohanan's arguments are intended to support two stipulations he makes concerning the morphological brackets. First, he asserts that "morphological brackets are incapable of blocking rules" (1986, p.20) and secondly, that "if a grammar has to distinguish between compounding and affixation, it may do so by making a stratal distinction, but not by making a distinction in terms of brackets" (p.128).

Mohanan's first two arguments are that a theory which does not distinguish X]Y from X][Y is more restrictive than one which does, and that, even given such a distinction, a theory allowing brackets to block phonological rules is less restrictive than one which disallows this. Not only are these points based on vague and inexplicit notions of restrictiveness and simplicity, but the reasoning behind them can also be questioned. We have already seen that a two-stratum model of the lexicon has various advantages over Mohanan's four-level model in that, for instance, it reduces the number of strata permitted to one cyclic and one non-cyclic. However, a two-stratum model can only work if we follow Kiparsky's hypotheses on morphological bracketing and its accessibility to the phonology (see 2.4. above). If Mohanan is correct, we must instead accept that a theory allowing, in principle, an infinite number of lexical strata with cyclic and non-cyclic strata arbitrarily interspersed is more restrictive than one which permits only two lexical levels, but allows the phonology to make reference to independently necessary morphological brackets. That is, we are instructed to prefer an unprincipled proliferation of strata over a constrained model with increased access to morphological information, in a theory which is in any case intended to promote integration of the phonology and morphology.

Mohanan's contention that brackets may not block phonological rules can be traced back to the SPE distinction of non-blocking formative boundary from other boundaries, which could both trigger and block rules. Like Chomsky and Halle, Mohanan does not deny that boundaries may appear to block rules, but chooses to encode this blocking via stratification rather than allowing phonological processes to make direct reference to morphosyntactic brackets:

"the effect of boundaries blocking rules is achieved in Lexical Phonology in the following fashion: Suppose rule R applies across boundary B_i, but is blocked by boundary B_j. If boundary B_i is created at stratum i and boundary B_j at stratum j, where j>i, we specify the domain of application of R as stratum i" (Mohanan 1986, p.21).

The fact that Mohanan allows brackets to trigger but not block rules in this way is merely a stipulation which in no way follows from the tenets of the theory; this is amply demonstrated by the existence of a completely opposing situation in Natural Generative Phonology, where Hooper asserts that non-phonological boundaries like the word and morpheme boundaries may block rules but not condition them (Hooper 1976, p.15). Mohanan attempts a justification, claiming that

"saying that the presence of brackets, which represent the concatenation and hierarchical structure of forms, can block phonological rules...is as conceptually incoherent as saying that the presence of features like [+ noun] can block the application of phonological rules unless mentioned by the structural description" (1986, p.143, fn.2),

But this objection can also be countered, for two reasons. First, Mohanan is quite happy to allow brackets to condition phonological rules, and I do not see why the presence of morphological brackets in a phonological rule should be perfectly admissible if they are to make the rule operate, but "conceptually incoherent" if they are to stop it. Secondly, it is clear that phonological rules must be able to refer to some kinds of morphological information - indeed, one of Mohanan's own criteria for the separation of lexical and postlexical rules is that lexical rules require access to such morphological information, while postlexical operations never do - and again it seems inexplicable that a phonological rule can be sensitive (as HM's Velar Softening rule is) to the presence of a feature like [+ Latinate], which refers to an etymologically-motivated division of the vocabulary peculiar to English, but not to morphological brackets, which encode a putatively universal distinction of stems from affixes.

Mohanan points out that, given his stipulation that blocking involves level-ordering, it is impossible for the morpheme boundary to block rules, capturing the SPE generalisation that the behaviour of + is different from that of other boundaries:

> "Since + is the boundary associated with stratum 1, the only way for a phonological rule to be blocked by + would be to assign a previous stratum as its domain. Since there is no such stratum 0, it follows that no phonological rule can be blocked by the morphological juncture at stratum 1, in this case symbolised in SPE by +" (Mohanan 1986, p.21).

It is easy to see Mohanan's problem. In SPE, + cannot block rules, and this holds in Mohanan's model, since blocking is expressed by locating the rule concerned on a previous stratum, and + corresponds to bracketing on Level 1, the highest level. However, Mohanan does not recognise separate boundaries like the + and # of SPE, but only morphosyntactic brackets, which are of the form] and [on all levels. It is clearly non-explanatory to say that brackets on Level 1 may not block rules, but that identical brackets on subsequent levels may do so; hence Mohanan's assertion that, in Lexical Phonology, brackets may not block phonological rules. In effect, Mohanan is making all brackets exceptional to accord with the exceptionality of brackets on Level 1.

A preferable solution might exploit the notion of accidental gaps. Phonological rules will be able to refer to morphological bracketing, which may either condition or block them at all levels of the lexicon, but with the proviso that, at least in English, Level 1 bracketing happens not to block rules. The effect of such blocking is actually achieved by the cyclic nature of Stratum 1 and the operation of the Strict Cyclicity Condition, which in my model, like that of Booij and Rubach (1987), will be restricted to the earliest lexical level. This insight, however, is lost in Mohanan's framework, since he allows cyclic and non-cyclic strata to be randomly interspersed, and does not regard Level 1 as the sole cyclic level. At the moment, we have insufficient cross-linguistic data to verify that Level 1 brackets universally fail to block rules, and consequently we cannot assume that such blocking is absent in English for any principled reason. Indeed, Mohanan (1986, p.59, fn.6) admits that he has had to posit a so-called 'Level Zero' for Malayalee English, presumably to permit apparent morphosyntactic blocking at Level 1. We are faced with a clear choice between a theory which forbids the blocking of rules by direct reference to independently necessary morphological brackets, achieving the effect of such blocking by a potentially infinite extension of the number of lexical levels in both directions, or one which allows phonological rules to be blocked by brackets on all levels - a possibility which is not fully exploited in English, where brackets on Level 1 are apparently not required to block rules. Furthermore, the latter model arguably better captures the SPE distinction between +, which may not block rules, and #, which is equivalent to Level 2 bracketing and which does block rules in SPE, with the added implication that this property of Level 1 bracketing, or +, is language-particular. It is, notably, only on Level 2 that reference to brackets is required in the case of the Syllabification rules discussed above.

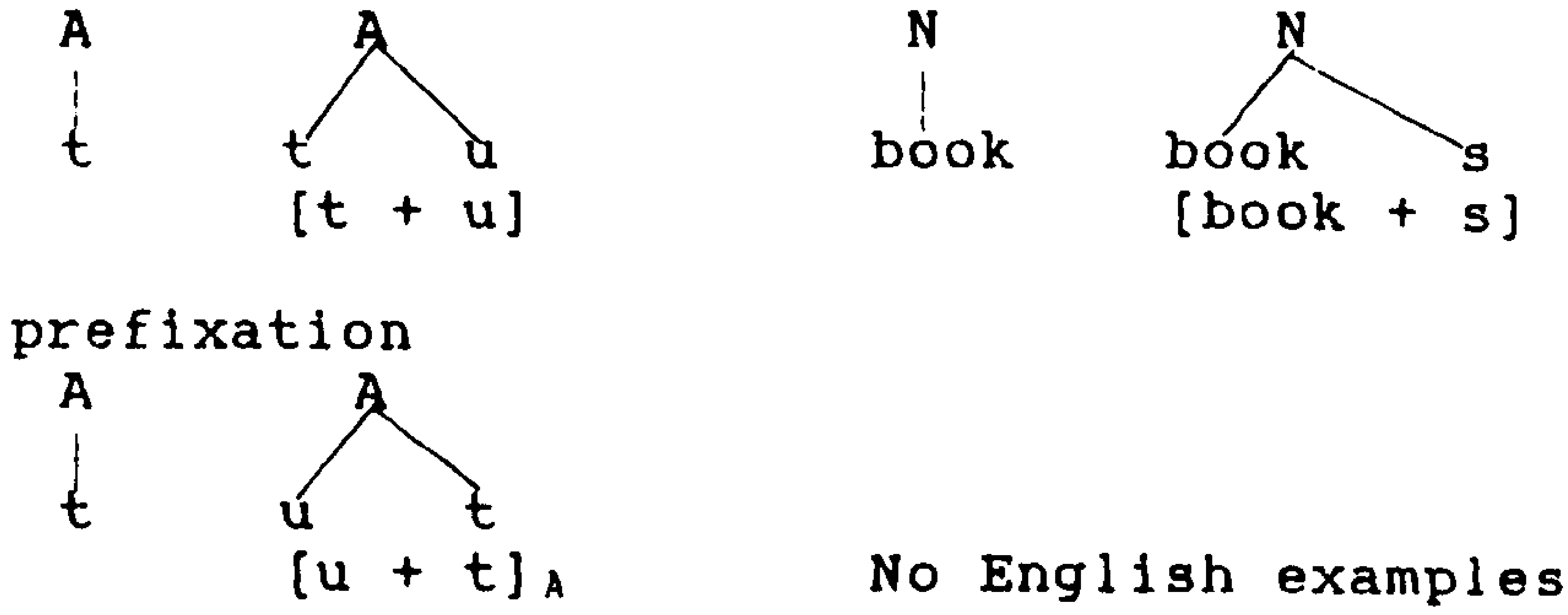
Even if we accept that morphosyntactic brackets should be permitted both to block and to condition phonological rules, a second problem arises over the configurations of brackets which correspond to different word-formation processes. The main question here is whether prefixation, suffixation and compounding should be differentiated, as Kiparsky and Strauss advocate (see (27) above), or whether the representation [[...][...]]

should be adopted for both affixation and compounding, as suggested by HM (1985) and Mohanan (1986).

Mohanan's argument here is that bracket notation encodes constituent structure, incorporating information on order of concatenation, linearity and categories: bracketing therefore corresponds to tree-diagram notation. Mohanan then notes that representations like [[[X]Y]Z] or [[X[Y]]Z] have no tree-structure counterparts, and argues that this "means either that brackets are not a notational equivalent of trees, or that the representations...are illegitimate" (1986, p.129). Since Mohanan is committed to the equivalence of brackets and trees, and its necessity, he must draw the second conclusion; and since the potentially illegitimate representations match Kiparsky's notation for a stem with two suffixes (e.g. *hopelessness*) and a stem with one prefix and one suffix (e.g. *unsafeness*) respectively, Kiparsky's bracketing system must be abandoned if Mohanan's argument holds.

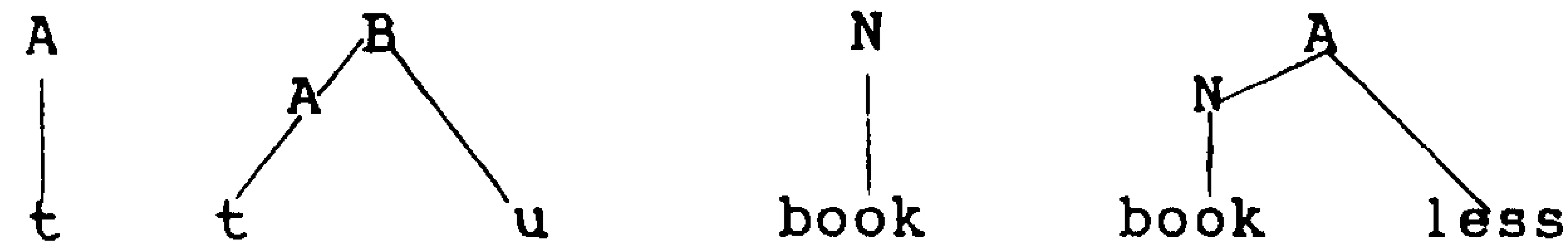
However, Mohanan's case rests on the assertion that Kiparsky's bracketing configurations have no tree-diagram equivalents; the provision of just such hierarchical representations by Strauss (1982) consequently robs it of much of its force. Strauss proposes representations like a., b., and c., in (28) below as the tree and bracket configurations corresponding to inflection, derivation and compounding respectively.

(28)
a. inflection
suffixation



b. derivation

suffixation

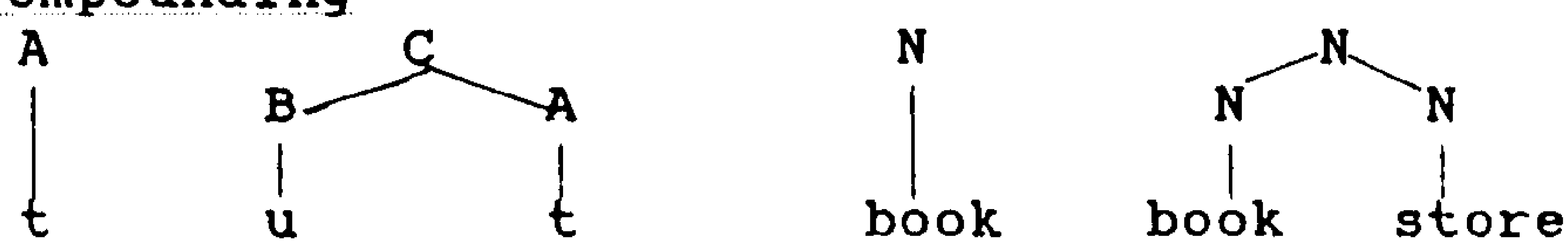


$[[t]_A u]_B$ $[[book]_N less]_A$

prefixation

$[u[t]_A]_B$ $[un[happy]_A]_A]$

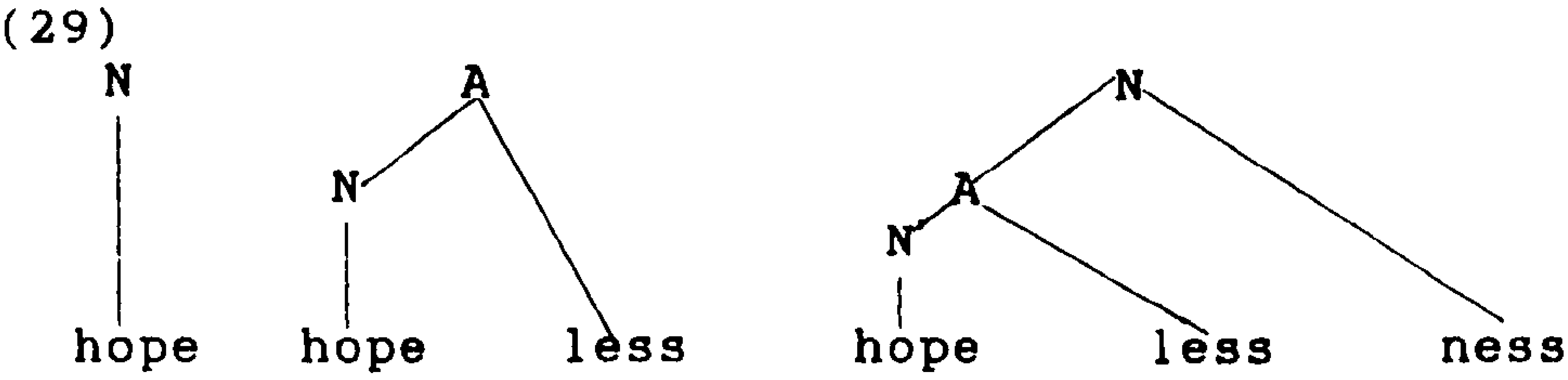
c. compounding



$[[u]_B[t]_A]_C$ $[[book]_N[store]_N]_N$

If these correspondences are accepted, Kiparsky's bracketings [[[X]Y]Z] (*hopelessness*) and [[X[Y]]Z] (*unsafeness*), which Mohanan claimed cannot be assigned tree-diagram counterparts, can be paired with the hierarchical structures in (29).

(29)



$[hope]_N]$ $[[hope]_N less]_A$ $[[[hope]_N less]_A ness]_N$

$[safe]_A$ $[un[safe]_A]_A$ $[[un[safe]_A]_A ness]_N$

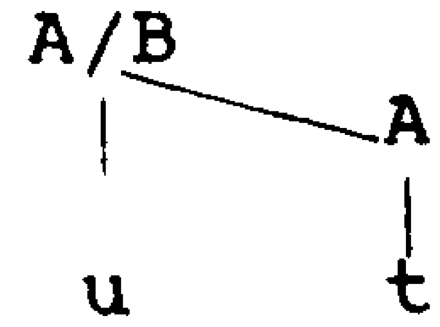
Mohanan acknowledges Strauss' tree diagrams, and admits that these would provide the morphological distinctions necessary to delimit the lexical phonology to two levels, at least for English. However, he objects to Strauss' model, Lexicalist Phonology, and to his introduction of inflectional representations entirely lacking internal bracketing. The first objection is irrelevant here, as Strauss' hierarchical representations can be accepted in isolation from his framework. The second seems more justifiable. Strauss proposes bracketings like [book s] for *books*, to indicate both that *-s* is a bound element, like all derivational and inflectional affixes, and that it does not cause a category change; in Strauss' view, additional external brackets serve only to show a categorial reassignment. However, his representation loses the generalisation that stems and words, like *book* in this case, are always autonomously bracketed, and makes it necessary for him to include the symbol +, giving [book + s], simply to show that two formatives are present.

I propose that inflection and derivation should instead be represented equivalently, as b. in (28) above, and that the category-changing versus category-maintaining parameter should be regarded as less significant, since it is not the case that all derivational affixation entails an alteration of category; for instance, prefixation of *un-* to an adjective produces a (negative) adjective (see the representations of *unhappy* and *unsafe* in (28) and (29)). The resulting tree and bracket notations are given in (30) below. Note that + is no longer required, and that stems and words are individually bracketed, while affixes are not. This development produces a system equivalent to that of Kiparsky (1982), and counters Mohanan's objections to both Strauss' and Kiparsky's systems.

(30)

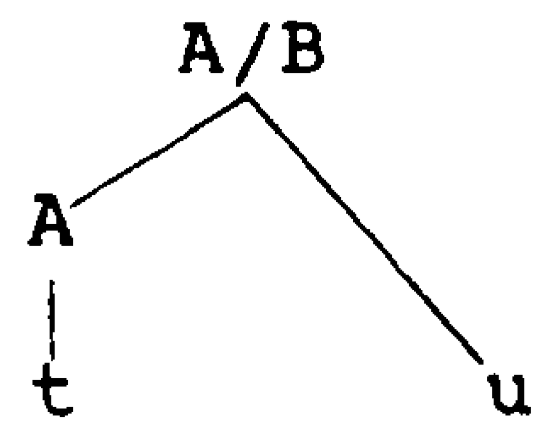
a. affixation - derivational and inflectional

prefixation



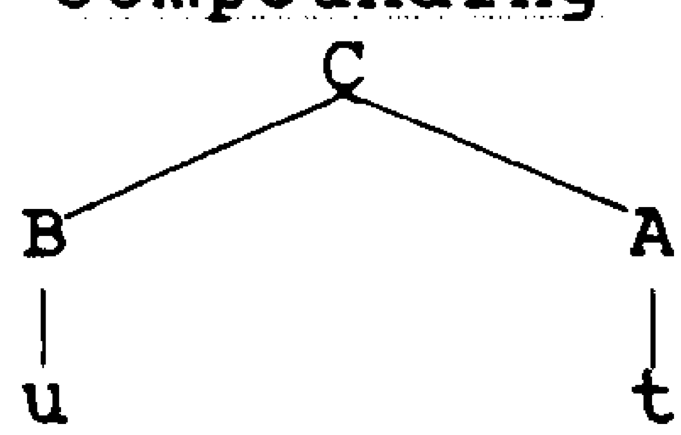
$[u[t]_{A}]_{A/B}$

suffixation



$[[t]_{A}u]_{A/B}$

b. compounding



$[[u]_{B}[t]_{A}]_{C}$

If this is not yet sufficiently conclusive, a little further evidence against Mohanan's representations of both compounding and affixation as [[...][...]] comes from Selkirk (1982a). Selkirk uses Kiparsky's system of bracketing, although she denies direct access of phonological rules to such brackets. Instead, affixes are marked with the special category label Af, while stems and words receive a lexical category symbol such as N, V or A. However, Selkirk's arguments are equally valid in support of a theory which does permit the morphological concatenation operators themselves to block and condition rules.

Selkirk argues that, for two main reasons, affixes and stems/words, and hence affixed items and compounds, must be differentiated in morphological structure, either using brackets and category labels, or brackets alone. First, she asserts that "compound words do not have the same phonology as affixed words" (1982a, p.123), a contention supported for English by a consideration of the rules discussed in Section 2.4. above, as well as the stress rules. Such rules, which "apply to, or interpret, morphological structures...must 'know' whether a morpheme is an affix or not" (p.123); and clearly, this difference can be encoded via bracketing.

Secondly, Selkirk argues that, if compounding and derivational affixation involved fundamentally the same word-formation process, "the word-structure rules required for generating affixed words would be the same as those generating compound words" (p.123). For derivationally affixed forms, Selkirk proposes the rules shown in (31); in Mohanan's model, where affixes are effectively regarded as stems/words, these would have to be replaced by the rules in (32), to accord with those for compounding.

(31) a. $V \rightarrow N\ V_{Af}$ (e.g. atom-ise)
$= [\ ]_N \rightarrow [[\ ]_N\ V_{Af}]_V$
b. $V \rightarrow A\ V_{Af}$ (e.g. soft-en)
$= [\ ]_A \rightarrow [[\ ]_A\ V_{Af}]_V$
c. $A \rightarrow V\ A_{Af}$ (e.g. fidget-y)
$= [\ ]_V \rightarrow [[\ ]_V\ A_{Af}]_A$

(32) a. $V \rightarrow N\ V$
$= [\ ]_N \rightarrow [[\ ]_N[\ ]_V]_V$
b. $V \rightarrow A\ V$
$= [\ ]_A \rightarrow [[\ ]_A[\ ]_V]_V$
c. $A \rightarrow V\ A$
$= [\ ]_V \rightarrow [[\ ]_V[\ ]_A]_A$

However, it is clear that the rules generating derived words and compounds cannot be the same, since actual compounds of the form generable by the rules in (32) do not exist in English.

We have shown, then, that Mohanan's and Halle and Mohanan's theory of morphological representations, which equates affixation and compounding and promotes stratal distinctions as opposed to phonological reference to morphological bracketing, makes wrong predictions in both the phonological and morphological domains. In addition, it can be demonstrated that Mohanan's objections to the bracketing system advocated by Kiparsky are groundless. I contend, then, that Kiparsky's representations should be adopted, and that brackets may block and condition phonological rules. A two-stratum model of the lexicon, incorporating these assumptions, will be adopted in the chapters below.

We shall now proceed to a reanalysis, within such a constrained framework, of two areas of synchronic English phonology which are dealt with unsatisfactorily by HM (1985): these are the treatment of the low vowels, and the related matter of diphthongisation, and the analysis of the [jū] sequence in *reduce, assume*. I shall demonstrate that HM rely on the mechanisms of SGP, producing abstract and ill-motivated analyses. These are untenable within a constrained model of LP, and must be replaced by alternative accounts, which will be shown to have various advantages in terms of decreased abstractness and increased coherence with external evidence.

3. Low Vowels

3.1. Introduction

In Section 1 above we saw that HM (1985) propose common underlying long and short vowel systems for RP and General American (GenAm); these systems were reproduced in (1). However, to incorporate the major phonetic divergence between the two reference accents, the realisation of the low vowels in words like *balm, bomb* and *baud*, HM introduce a set of three special rules, a/o-Tensing, ɔ-Unrounding, and o-Lowering. All three of these operate in GenAm, giving the derivations shown in (33).

(33) GenAm:	balm	bomb	baud/caught
	/a/	/ɔ/	/o/
a/o-Tensing:	a_t	–	o_t
ɔ-Unrounding:	–	a	–
o-Lowering:	–	–	$ɔ_t$

However, HM contend that only a/o-Tensing applies in RP, producing the truncated derivations of (34).

	balm	bomb	baud/caught
(34) RP:	/a/	/ɔ/	/o/
a/o-Tensing:	a_t	–	o_t

HM's analysis is unsatisfactory for several reasons:

1. HM exaggerate the height of the vowel found in RP *baud/caught*. The mid vowel /o/ may have been characteristic of conservative RP, but low /ɔ̄/ is now standard.
2. The GenAm derivations in (33) preserve a surface contrast of *balm* [a_t] and *bomb* [a]. Wells (1982), however, assumes that underlying /ɒ/ in words of the *bomb* type is lengthened, tensed and unrounded to merge with the long low unrounded tense /ɑ̄/ of *balm* words. Wells also asserts that "the result of the merger is phonetically usually a rather long vowel" (1982, p.246), although HM consider their [a_t] and [a] to be short.
3. HM (p.101) assign *shot* and *lost* the underlying vowel /o/, which will tense and lower to [$ɔ_t$] in GenAm, although phonetically these words have [a]. This representation is also incorrect for RP, in which *shot* and *lost* surface with [ɒ], not [o_t].

In view of these criticisms, I propose that, in RP, *balm* will have underlying and surface long tense /ɑ̄/ [ɑ̄], *bomb* short lax /ɒ/ [ɒ], and *baud/caught* long tense /ɔ̄/ [ɔ̄]; note that, although HM regard length as the underlying dichotomiser of the English vowel system, with tenseness introduced subsequently during the derivation, I shall consider long and tense, and short and lax, as present both underlyingly and on the surface. This position will be justified below. The same representations will hold for *balm* and *baud/caught* in GenAm. However, the derivation of *bomb* words in GenAm is not quite so straightforward.

Given HM's self-proclaimed aim of "...[assigning] to a form a representation such that a set of independently motivated rules will produce the prescribed output" (1985, p.106), and the associated assumption of SGP that it is through these rules that dialect variation should be encoded, the purpose of the derivations in (33) and (34) is clearly to ensure common underlying forms in GenAm and RP for the low vowels, with surface variation introduced by rule. If this identity of underlying representations is to be maintained, *bomb* words must be assigned underlying /ɒ/, as is the case in RP, and a rule must be formulated to merge /ɒ/ with /ɑ̄/ on the surface. If there are accents of GenAm, as HM claim, in which *bomb* and *balm* words are kept distinct, this variation can then be encoded in the form of the unrounding rule, as shown in (35).

(35)

	Dialect A	
	balm	bomb
	/ɑ̄/	/ɒ/
Unrounding, tensing, lengthening:	–	ɑ̄

	Dialect B	
	balm	bomb
	/ɑ̄/	/ɒ/
Unrounding, lengthening:	–	ɑː

However, absolute neutralisation is clearly involved, jeopardising the synchronic status of /ɒ/ in GenAm, and hence of any rule affecting it: it might seem more plausible to omit /ɒ/ from the modern GenAm vowel system, since all words which historically contained /ɒ/ [ɒ] now have either [ɑ̄] (like *cot* and *stop*) or [ɔ̄] (like *cough* and *salt*) on the surface. Mohanan's principle (see Chapter 1 above) that underlying and lexical representations should be equivalent in non-alternating forms should then dictate that these lexical sets be represented underlyingly with [ɑ̄] or [ɔ̄] respectively. I shall return in Chapter 3 to the question of possible motivations for a rule unrounding /ɒ/ in GenAm, based on the interactions of forms containing low vowels with the synchronic Vowel Shift Rule, and to the associated matter of the differentiation of related dialects. For the moment, it should simply be noted that our constrained lexical model is already pressurising us to adopt more concrete underliers and less complex derivations.

3.2. The *Father* Vowel

The derivation of the low vowels will be a recurring area of controversy throughout this thesis; we shall see in Chapter 5 that these vowels are equally problematic in Scots and Scottish Standard English. For the moment, however, I shall turn to a more detailed consideration of one low vowel in RP and GenAm. This is the [ɑ̄] of *balm* and *father* and, in some varieties of GenAm, of *bomb*.

The problems involved in the derivation of the stressed vowel in such words as *father, rather, Chicago, ga'rage* and *balm* are familiar from SPE: the *father* vowel is phonetically long and tense, yet it does not diphthongise or undergo Vowel Shift. Hence, an underlying representation must be found which can be converted into the appropriate surface vowel but is also exempt from the Vowel Shift Rule and Diphthongisation.

This challenge has produced solutions of varying degrees of credibility. Chomsky and Halle in SPE propose tense low back unrounded /ā/ as the underlying vowel for *father*, and remove it from the scope of Vowel Shift by restricting the input of this rule to vowels which are [α back, α round]; this condition also prevents /ǣ/, the SPE source for [ɔI], from shifting. However, in SPE /ā/ is not exempt from Diphthongisation, but receives a following /w/ glide, which is then vocalised, shifted and unrounded to produce the representation [āʌ] (see (36)).

(36)

Underlying:	/fāəVr/
Diphthongisation:	āw
Glide Vocalisation (after /ā/):	āʊ
Vowel Shift (extended to lax /ʊ/):	āo
Rounding Adjustment:	āʌ

This [ʌ] may then be realised as "a centering glide of some sort or a feature of extra length" (SPE, p.205).

The SPE analysis involves extending the structural description of Rounding Adjustment and allowing Vowel Shift, a process historically and otherwise synchronically confined to the long vowel system, to apply to a short lax vowel derived from an offglide; and its product is an exceptional representation which is ambiguous as to its pronunciation. Halle (1977) is therefore clearly justified in abandoning such a problematic method of deriving the stressed vowel of *father*, and in proposing an alternative solution.

Since Halle (1977) does not allow lax vowels to undergo Vowel Shift, his account cannot vocalise and shift glides. However, since *father* is not phonetically *[fāwðə(r)], Halle must make the vowel he selects as underlier an exception to both Vowel Shift and Diphthongisation. He does so by modifying the redundancy rule linking length and tenseness in English (37) so that it "admits both tense and lax varieties among long low vowels, but not elsewhere" (Halle 1977, p.618).

(37)

$$[\alpha\ \text{long}] \text{ ---> } [\alpha\ \text{tense}] \quad / \quad \begin{bmatrix} \text{-----} \\ -\ \text{low} \\ -\ \text{long} \end{bmatrix}$$

(Halle 1977, p.618, No.18)

Halle then assigns the underlying long lax vowel $/a_l/$ to *father, Chicago*, etc.. Diphthongisation and Vowel Shift are both sensitive to tenseness, and hence neither will apply to $[a_l]$, although both will operate on the low tense unrounded vowel $/a_t/$, as shown in (38).

(38)	father	volcano
Underlying:	/a_l/	/$\bar{a}_t$/
Vowel Shift:	--	$\bar{e}$
Diphthongisation:	--	$\bar{e}$y

Halle also finds it necessary to reformulate the English Stress Rule so that long, rather than tense vowels will be stressed, to account for the stress on /a_l/ in *Chicago, soprano* and so on.

Halle and Mohanan (1985) similarly choose to exploit discrepancies between length and tenseness in their characterisation of the *father* vowel. However, whereas Halle (1977) proposed a long lax low unrounded vowel, HM prefer a short tense one. More accurately, they assign short back low unrounded /a/ to *father, Chicago, balm* underlyingly, but /a/ is then subject to a/o-Tensing (see Section 3.1. above) and is said to surface as [$\bar{a}_t$] in both RP and GenAm. Since HM restrict the Vowel Shift Rule and Diphthongisation to long, rather than to tense vowels, /a/ will, as required, be exempted from these rules. HM also claim that their analysis allows them to eliminate the feature [± tense] from underlying representations, but since they assume that the Main Stress Rule is also sensitive to length (1985, p.76), they are forced to assign a diacritic feature [+ accented] to the penultimate syllable of *Chicago, sonata, soprano* and similar trisyllabic forms to account for their otherwise exceptional stress pattern.

Objections can be raised against all three analyses examined above. I have already pointed out some difficulties inherent in the SPE account: as for the others, Halle (1977) seems to be using laxness merely as a diacritic to dichotomise instances of the same vowel into Diphthongising and Shifting versus 'static' sets, while HM, by assigning a short lax underlying vowel to *father* and *Chicago*, create difficulties for their stress rules and are also forced to resort to diacritic marking.

Furthermore, HM cannot derive the long vowel pronunciations which are characteristic of the stressed vowel in *father, balm, spa* and others in American accents and in RP: although HM do propose a rule of Long Vowel Tensing (No.41, p.73), which redundantly tenses all long vowels, they have no mechanism for lengthening tense vowels, and [a_t] is consequently predicted to surface short.

We have already noted that, in SGP, two assumptions govern the shape of the underlying system and of derivations. First, it is supposed that surface dialect differences must represent rule-governed departures from an underlyingly uniform system; and secondly, remote underliers and 'free rides' are positively encouraged by the simplicity metric, producing the assumption that, if a form can conceivably be subjected to a particular derivation, then this must be done. The importation of these assumptions into LP is, I believe, the source of many of HM's problems of abstractness, and of their difficulties in producing a plausible account of areas like the low vowels. However, although HM (1985) adopt these Standard Generative ideas, they are not a necessary part of LP, and we are therefore free to pursue alternative solutions.

My first observation is that forms like *father* surface with the back vowel assumed by Chomsky and Halle (1968), Halle (1977) and HM (1985) in only some accents of English, including GenAm and RP. In some Scots dialects, Australian and New Zealand English, and certain areas of England such as West Yorkshire (see Wells 1982), the *father* vowel is realised phonetically as front. In a SGP account, these two sets of realisations would be derived synchronically from a single underlying vowel, reflecting the probable historical origin of the divergent forms. However, in LP we are not tied to such an analysis, and I propose therefore that the *father* vowel should be assigned two distinct underliers: these will be back /ā/ in accents like RP and GenAm with a phonetically back vowel in *father* words, and front /ǣ/ in those accents where the *father* set surface with front vowels. Short lax /a/ (from Halle's system) and long lax /ɔː/, /aː/ (from Halle and Mohanan's) will then be eliminated from all underlying English vowel systems, and the perfect correlation of length and tenseness which was disturbed by Halle's and HM's treatment of the *father* vowel will be restored. Two sample systems are given in (39). The back unrounded vowels /ɨ ɨ̄ ʌ̄/ which figure in HM's system are omitted for the moment, but will be considered in Section 4.

(39) a. RP

	Lax vowels		Tense vowels	
	front	back	front	back
high	I	ʊ	ī	ū
mid	ɛ	ʌ	ē	ō
low	æ	ɒ		ā ɔ̄

b. Scots (see Chapters 4 & 5)

	Lax vowels			Tense vowels	
	front		back	front	back
high	I			i	u
mid	ɛ		ʌ	e	o
low		a		æ	ɔ

The immediate difficulty for this proposal is the problem of exempting words like *father* from the Vowel Shift Rule and Diphthongisation. In dialects with the tense low vowel pattern of (39)a. above, /ā/ will presumably shift to [ʌ̄] unless we impose an ad hoc restriction like the SPE exemption of vowels which are not [α back, α round]. In the second set of dialects, *father* words will share the underlying /ǣ/ vowel with *volcano, sane* and *profane*, which undergo Vowel Shift and Diphthongisation to produce surface [ēy]. Similarly, in both sets of dialects, Halle's (1977) /ɔː/ and /ɔt/ have been replaced with /ɔ̄/, and the non-alternating forms for which Halle proposed /ɔɪ/ will now share underlying /ɔ̄/ with alternating pairs like *verbose - verbosity*. Again, it will be predicted that these will undergo Vowel Shift and Diphthongisation.

Although an ad hoc restriction of the Vowel Shift Rule might be considered for /ā/, in accents with /ǣ/ our only solution seems to be exception-marking. It is true that only a small set of forms (*calm, palm, balm, spa, father, rajah, Chicago, psalm, Shah, bra, garage, rather, sonata, soprano* and *errata*) is involved, so that this exception-marking need not be extensive. It is also clear that all these exceptional forms are non-alternating, so that our more concrete analysis is supported by guidelines such as Mohanan's assertion that underlying and lexical representations should be identical in the absence of alternations. Nonetheless, we cannot rigidly enforce such requirements. The difficulty of imposing such a constraint on the grammar is paralleled by the earlier difficulties of imposing the Alternation Condition (Kiparksy 1973) or Naturalness Condition (Postal 1968), which led to the introduction of the SCC. This condition proved to be more enforcable; and indeed, our problematic forms would be exempted automatically from Vowel Shift and Diphthongisation if these rules operated on Level 1, within the scope of the Strict Cyclicity Condition. In all current version of LP, however, and notably in HM (1985), these rules are said to apply later in the lexicon, beyond the domain of SCC. This exemption of the core rules of the English vowel phonology from the constraints of LP by locating them on Level 2 is one of the main sources of abstractness in LP, and will prove to be a recurring difficulty in the promotion of more concrete analyses. A possible reanalysis of the Vowel Shift Rule, taking account of this criticism, will be proposed in Chapter 3. For the moment, however, I shall concentrate on a revision of Diphthongisation.

Words like *father* may, then, be marked [- Vowel Shift], but we have not yet found a way of excluding non-shifting /ǣ/ or /ā/ from Diphthongisation. The *father* vowel frequently surfaces as a long steady-state monophthong rather than a sequence of vowel plus offglide; it was this fact that Chomsky and Halle were trying to deal with, while still retaining their generalisation that tense vowels attract offglides, by vocalising and shifting the /w/ glide after /ā/ and allowing for the realisation of the resulting [ʌ] as "a feature of extra length" (SPE, p.205). It is perhaps worth considering in this context the proposition that it is not the low vowels which are at fault, but the Diphthongisation rule itself.

The production of [aI] and [aʊ] via the Vowel Shift Rule and Diphthongisation commits us to the generation of surface diphthongs from underlying monophthongs and to the prohibition of underlying diphthongs, a situation dating from Chomsky and Halle's assertion (SPE, p.192) that

> "contemporary English differs from its sixteenth or seventeenth century ancestor in the fact that it no longer admits phonological diphthongs - i.e. sequences of tense low vowels followed by lax high vowels - in its lexical formatives."

This declaration has won widespread acceptance, despite the fact that Chomsky and Halle fail entirely to cite any evidence or justification for it. Indeed, since modern English, like earlier stages of the language, has surface diphthongs, it is hard to see why the language should have retained this category phonetically, but opted for a phonological restructuring. The main motivation for this supposed innovation is surely that using a Diphthongisation rule enables a more 'elegant' analysis, which remains plausible only if <u>all</u> surface diphthongs are derived from monophthongal sources. It is unfortunate, then, that Diphthongisation is not maximally general. For instance, in RP only the long mid monophthongs /ē ō/ are realised consistently as the diphthongs [ēI], [ōʊ]; the high and low vowels /ī ū ɔ̄ ā/ may surface without offglides. In Scots and Scottish Standard English, there is no Diphthongisation at all, and the long vowels of *bee, day, you, go*, etc. are phonetically monophthongal. In such dialects, a Diphthongisation rule would be used solely to derive surface [ʌi], [ʌu] and [ɔi] in *divine, profound* and *boy*, etc., and forfeits its claim to be an independently motivated process which is simply extended to these cases, simplifying the underlying vowel system.

A final problem for Diphthongisation is that, while it has proved relatively easy to derive [aI] and [aʊ] from shifted and diphthongised /ī/ and /ū/, finding an appropriate underlier for [ɔI] has been more taxing. Various contenders have been proposed, the most notorious being the low front rounded /œ̄/ of SPE. The major, and perhaps only, advantage of this choice is that it will regularly undergo Diphthongisation to become [œ̄y], thus accounting for the appearance in [ɔ̄y] of a front offglide after a back vowel. However, /œ̄/ also causes several complications for Chomsky and Halle; for instance, it has to be exempted from the Vowel Shift Rule, and it is always tense, so that the Laxing rules will have to be restricted (SPE, p.192). Furthermore, /œ̄/ never surfaces in English as a monophthong, and since [ɔ̄y] is never involved in morphophonemic alternations (the few apparent examples, such as *destroy - destruction*, are almost certainly too rare to constitute regular alternations and would be better dealt with using allomorphy), the assignment of a remote underlier like /œ̄/ to *boy, coin* and so on is in clear violation of Mohanan's condition that underlying and lexical representations should be identical in non-alternating forms.

The fundamental theoretical objections which have been marshalled against absolute neutralisation are numerous and well-known (Kiparsky 1973); and quite apart from these, the status of /ǣ/ as an English vowel is dubious in the extreme. Chomsky and Halle attempt to make their chosen representation plausible by claiming that "/ǣ/ in fact constitutes an otherwise unexplained gap in the phonological pattern" (SPE, p.192), but this assertion lacks conviction for two reasons. First, as Kiparsky (1973) points out, it is always possible to make a remote underlying representation and neutralisation rule look natural, since every language will have some apparent 'gaps' in its phonological system. Secondly, front rounded vowels are cross-linguistically rare, and no language with a surface low front rounded vowel but no corresponding high and mid vowels, /y/ and /ø/, has yet been recorded. Since neither /y/ nor /ø/ figures in modern English phonology (even in SPE), it seems that /æ/ is not a lone, unexpected gap in the system, but rather one of a whole series of vowels which are simply not part of the modern English inventory.

The downfall of /ǣ/, but the retention of the SPE-style assumption that English, for whatever reason, has ceased to have underlying diphthongs, has led to a number of alternative derivations of [ɔI], none markedly more successful than Chomsky and Halle's attempt. For instance, Zwicky (1974) suggests that /ʌ̄/ is the most appropriate source for [ɔI], claiming that his view is supported "by the few actual alternations and by general constraints on phonological systems" (p.59). Halle (1977) tentatively proposes deriving [ɔI] from /ū/, via Vowel Shift, Diphthongisation and a Glide-Switching rule, while Halle and Mohanan (1985) are unable to choose between /ū/ and /ǖ/. Deriving [ɔI] from /ū/ would, as in Halle's account, involve Vowel Shift and Diphthongisation to [ɔw], and a further rule fronting the glide; HM do not, however, propose to unround [w], and the final output will therefore be neither [ɔy] nor [ɔw], but some amalgamation which I will not attempt to transcribe. If /ǖ/ is preferred as a source vowel, Vowel Shift, Diphthongisation and a rule of Diphthong Backing (HM 1985, p.101) will produce [ɔy], but HM are reluctant to adopt this ostensibly simpler derivation as

> "it would require a special weakening of the principles that determine the feature complexes in the system of underlying vowels, since the system would now have to include instances of the somewhat marked category of rounded front vowels" (HM 1985, p.102).

This is scarcely a convincing objection, given that HM include in their underlying modern English vowel system /ɨ ɨ̄/ and /ʌ̄/, three non-surfacing instances of the arguably even more marked category of back unrounded vowels.

All the derivations outlined above involve context-free deletion of an underlying element, albeit involving marginally less unnatural underliers than the /œ̄/ of SPE. However, when confronted with such a variety of inventive and unconstrained analyses, it is hard not to sympathise with Rubach (1984), who at first suggests deriving [ɔI] from /ō/, but observes in a footnote (no.13, p.35) that

> "the whole endeavour of deriving /ɔj/ [= [ɔI] AM] may not be worth the trouble...one might as well give up the generalisation that English has no underlying diphthongs, and so derive *boy* from //bɔj//."

As Rubach notes,

> "with /ɔj/, the only motivation for assuming a representation different from the surface is an attempt to exclude diphthongs from the inventory of underlying segments in English" (1984, p.35).

The question raised by [ɔI] is whether absolute neutralisation and the assignment of abstract underliers to non-alternating forms are really more desirable than the addition of /ɔI/ to the underlying vowel inventory of English. On the whole, it seems that deriving [ɔI] from /ɔI/ is the better solution. And if /ɔI/ is to be permitted underlyingly, then it is a very small step also to include /aI/ and /aʊ/, which also appear in non-alternating forms like *high, bright, fine* or *loud, round, crowd*.

I propose, then, that the underlying vowel system(s) of modern English should contain the diphthongs /ɔI/, /aI/ and /aʊ/. Only three diphthongs are involved (centring diphthongs like [Iə], [ʊə] in RP *here, poor* are more amenable to derivation from underlying sequences of vowel plus /r/), and only sequences of low vowel plus high non-syllabic vowel or offglide are permitted, so that the size and complexity of the vowel system will not be greatly increased. The SPE/HM Diphthongisation rule will be replaced by a rule lengthening tense vowels (except in Scots and Scottish Standard English, where vowel length is governed by the Scottish Vowel Length Rule - see Chapters 4-6), and a dialect-specific rule diphthongising long/tense vowels. The latter may be entirely absent, as is the case in Scots, or may apply to some subset of the long vowels; thus, for some RP speakers only the mid vowels diphthongise, while for others the high vowels are also affected.

The resulting system also has the advantage of being considerably more concrete, and a number of rules, including SPE Rounding and Backness Adjustment, Halle's (1977) Glide Switching and HM's Diphthong Backing, will no longer be required. In return, however, a subrule will have to be added to the Vowel Shift Rule, to convert high monophthongs into the diphthongs [aI] and [aʊ] directly, rather than via low monophthongs (see (40)).

(40)

The diphthongs therefore function synchronically only as targets to which other vowels shift; they do not shift themselves, although diphthongs were directly involved in the historical Great Vowel Shift. This synchronic exemption of diphthongs solves the problems of 'free rides' for items like *fine, pound*, which can now be represented with non-shifting underlying diphthongs rather than as /f$\bar{i}$n/, /p$\bar{u}$nd/.

4. The Derivation of [jū].

4.1. Introduction

I shall now turn to the [jū] sequence of sounds and the related vowels [ū], [ʌ] and [ʋ], a second area of English phonology which has occasioned abstract analyses, to see whether [jū] is also amenable to a more concrete reinterpretation. Some sample words with [jū], [ū], [ʌ], [ʋ] and the [jū]-[ʌ] alternation are shown in (41) and (42): note that I am only concerned with [Cj] clusters, not sequences of [j] plus vowel alone.

(41)	cube	tabular	reduce - reduction
	avenue	angular	assume - assumption
	issue	ambiguous	consume - consumption
	venue	ambiguity	study - studious
	accuse	habitual	Malthus - Malthusian
	huge	credulous	Lilliput - Lilliputian
	duke	credulity	
	tube	architecture	

(42)	[ū]	[ʋ]	[ʌ]
	juke-box	pull	profundity
	acoustic	push	putt
	chew	bush	but
	blue	cushion	couple
	rude	put	fund
	woo	soot	pun

The main problems raised by [jū], [ū], [ʌ] and [ʋ] for a phonological description of RP and GenAm are the following:

1. What is the status of the [j] glide which appears before [ū]?
2. How can we capture the fact that [j] appears predominantly before [ū], but not before every instance of this vowel?
3. How are we to account for the fact that [ʌ] alternates with both [aʋ], as in *profound* - *profundity*, and [jū], as in *reduce* - *reduction*?

4. What are the most appropriate underlying vowels for [jū], [ū], [ʌ] and [ʊ]?

I shall outline the answers given to Questions 2-4 by Chomsky and Halle (1968), Halle (1977), Rubach (1984) and Halle and Mohanan (1985) below, and will then offer an alternative account. However, I must first address Question 1 above: what is the status of the [j] glide in the [jū] sequence?

4.2. The Status of [j] in [jū]

As Halle and Mohanan point out,

> "It is well known that the sequence [Cy] in English is regularly followed by the vowel [uw] or its unstressed reduced reflex. Thus, although [kyuw] *Kew*, [kyut] *cute*, as well as [kwiyn] *queen*, [kwæk] *quack*, [kwam] *qualm*, [kwowt] *quote*, etc., are well-formed, *[kyiyn], *[kyæk], *[kyam], *[kyowt], etc., are not" (1985, p.89).

There are two possible ways of dealing with this observation in a phonological description: either [j] could be treated as nuclear, so that [jū] would constitute a diphthong, or [j] could be inserted by rule in the onset, before the vowel which eventually surfaces as [ū] (or [ūw]). SPE, Halle (1977), Rubach (1984) and HM all prefer the latter alternative, but there have been attempts to treat [jū] as diphthongal, and I now turn briefly to one of these.

Anderson (1987) is a discussion of the modern English vowel system in the framework of Dependency Phonology, in which [jū] is treated as a diphthong [Iu], derived either from long, tense /Iu/, or from short, lax /IV/; the latter is an underlying combination of {i} plus the 'unspecified vowel' (see Anderson 1987, p.33). We are not concerned here with the details of Anderson's analysis, but rather with the treatment of [jū] as a diphthong and the related contention that [j] in this sequence is nuclear. These assumptions lead to various problems: for instance, Anderson must analyse his /Iu/ as a rising diphthong, although this category is not normally proposed for either modern English or earlier stages of the language, and is furthermore uncharacteristic of the modern Germanic language family as a whole. Anderson's system also relies on under- and un-specification, theoretical devices not employed here (see Chapter 1).

Experimental evidence from speech errors is also relevant to a discussion of the structural status of [j] in [jū]: Shattuck-Hufnagel (1986), for instance, believes that a study of speech error patterns is important in deciding whether [j] is nuclear or not, since earlier work has shown that "polysegmental error units tend to respect the onset - rhyme boundary" (1986, p.130) - in *clamp*, for instance, [l] may form an error unit with the preceding [k], since both are in the onset, but not with the following vowel. On the basis of 70 errors involving [jū] taken from the MIT error corpus, Shattuck-Hufnagel observes that, although the [jū] sequence may on occasion function as an error unit, as in *m*[jū]*sarpial* for *mars*[jū]*pial*, there is a far larger number of cases, 33 in all, in which [j] constitutes an error unit in isolation from [ū], interacting with another C (see (43)).

(43)	rusing	for	using
	cues	for	crews
	[krūk-]	for	cucumbers
	[flūz-]	for	fuse blown
	writing rutensil	for	utensil

(Shattuck-Hufnagel 1986, p.130)

The fact that "a /j/ before /ū/ interacts freely with other onset consonants in errors" (Shattuck-Hufnagel 1986, p.132) suggests strongly that /j/ itself forms part of the onset. There are, however, no examples in the corpus of C/j/ acting as an error unit, as would be expected if /j/ is indeed an onset consonant, given that entire onsets composed of CC clusters do tend to function as error units in other cases. Shattuck-Hufnagel offers two possible explanations for this behaviour; /j/ may 'move' during the derivation from being closely bound to the /ū/ vowel to associating more regularly with other onset consonants, or more simply, the present error corpus may be too restrictive, and a survey of a larger amount of data may well provide examples of C/j/ error units. In any case, these findings support the hypothesis that [j] in [jū] is an element of the onset, and are consequently "at least compatible with the suggestion...that onglide /j/ before the vowel that surfaces as [ū] is inserted by rule" (Shattuck-Hufnagel 1986, p.132).

Perhaps the strongest evidence against a diphthongal analysis of [jū], however, comes from the relationship of phonotactics and syllable structure. Selkirk (1982b) notes that one of the primary motivations for separating the onset from the rhyme and, within the rhyme, the nucleus from the coda, is the presence of phonotactic restrictions. For English at least,

> "it is within the onset, peak and coda that the strongest collocational restrictions obtain", since "the likelihood of the existence of phonotactic constraints between the position slots in the syllable...is a reflection of the immediate constituent (IC) structure relation between the two slots: the more closely related structurally...the more subject to phonotactic constraints two position slots are" (Selkirk 1982b, p.339).

Selkirk makes the strong claim that English has no phonotactic restrictions between onset and nucleus. This claim would, however, be refuted by the proposed diphthong /Iu/, since the [j], or [I] segment is permissible only after certain onset consonants: we shall see later that after /r/, /w/, /ʃ/ and /dʒ/, for instance, [u] surfaces alone, without [j]. These distributional restrictions are easily explicable if [j] is an onset consonant, since phonotactic constraints within the onset are, Selkirk suggests, to be expected, and any rule inserting /j/ will simply not be permitted to contravene these phonotactic restrictions. But they are hard to account for if [j]/[I] is nuclear, since we will then be faced with a situation where a single vowel is distributionally restricted on the basis of the preceding onset consonant(s).

Finally, the hypothesis that [j] is an onset consonant introduced by epenthesis is supported by the fact that [j] is acceptable after [m] and [v], as in *muse, view*, although /m v/ do not otherwise cluster.

On the basis of the arguments above, I shall regard [j] in [Cjū] sequences as an onset consonant inserted by rule before a specific vowel, or set of vowels, which surface eventually as [ū]. The underlying vowel(s) involved, and the nature of the j-Insertion rule(s), are discussed at length in SPE, Halle (1977), Rubach (1984) and HM (1985), and I shall now review their analyses.

4.3. The SPE Account

Before considering the SPE analysis of [jū] in detail, I should point out that the sample words in (41) above can be split into four subsets. Some forms with surface [jū], like *tabular* and *angular*, alternate with base forms, in this case *table* and *angle*, in which there is no vowel corresponding to [jū] in the derived forms. In SPE, a rule inserting /v/ in *tabular, angular* was proposed (see (44)); this procedure has generally been followed in subsequent studies.

(44)

$$\emptyset \longrightarrow v \;/\; \begin{bmatrix} -\text{cont} \\ -\text{voc} \\ +\text{cons} \end{bmatrix} \;\text{---}\; \text{l} + \text{VC}\ [-\text{seg}]$$

(SPE No.56, p.196)

In the second set of [jū] words, which includes *ambiguous, ambiguity, credulous, credulity* and *habitual*, the vowel surfacing as [jū] is present underlyingly, but as part of a morpheme distinct from the stem. In SPE, this morpheme is taken to be the "stem-forming augment" (p.195) [+ʋ], which is stored along with certain underlying lexical items and subsequently deleted word-finally but retained before affixes. The remaining words in (41) fall into two further classes; those in which [jū] alternates with [ʌ], as in *reduce* - *reduction* or *study* - *studious*, and non-alternating forms like *cube, argue, venue, huge* and *duke*.

In SPE, surface [jū] always corresponds to underlying high back lax rounded /ʋ/ (= /u/ in SPE), regardless of whether this is part of the stem, an augment, or inserted by rule. /ʋ/ is subject to a rule producing tense, unrounded [ɨ̄] (see (45)), which provides the context for /j/-Insertion before being unconditionally rerounded; since [ɨ̄] is [+ back, - round], it will not undergo Vowel Shift.

(45)

$$\text{ʋ} \longrightarrow \begin{bmatrix} +\text{ tense} \\ -\text{ round} \end{bmatrix} \; / \; \text{---} \; C_0^1 \; V$$

(SPE No.52, p.195)

In order to meet the structural description of Rule (45), *reduce, cube, huge, venue* and so on have to be represented underlyingly as /re=dʋkɛ/, /kʋbɛ/, /hʋgɛ/ and /vɛnʋɛ/ (see SPE pp.195-6), with the final /ɛ/ being disposed of later in the derivation. In *tabular*, where [jə] may surface rather than [jū], a further rule laxing unstressed /ɨ̄/ is also necessary. In addition, to account for the appearance of [ʌ] in *reduction* and *study*, Chomsky and Halle are forced to allow lax /ʋ/ to undergo Vowel Shift, and to extend the structural analysis of the Rounding Adjustment rule to convert the resulting [o] to [ʌ]. The same derivation, involving Vowel Shift, applies to [ʌ] in *profundity*, although here the underlying vowel is tense /ū/, which undergoes Vowel Shift, Rounding Adjustment and Backness Adjustment to [āw] in *profound*, but laxes, shifts and unrounds in *profundity*.

Despite even the additional rules which produce and remove [ɨ̄], the extension of Vowel Shift and Rounding Adjustment to lax vowels, and the rather badly-motivated final /ɛ/ in *reduce, cube, venue,* Chomsky and Halle encounter problems with [jū], [ʌ] and [ʊ]. The extension of Vowel Shift to lax /ʊ/ will convert all underlying cases of this vowel (unless they are first tensed and unrounded to [ɨ̄]) into surface [ʌ]; and indeed, this strategy is used in SPE to derive *putt, fund, pun* and so on. However, there are forms, for instance *push, pull, cushion, put* and *soot*, which have phonetic high back lax rounded [ʊ]. According to Chomsky and Halle, this vowel is produced using the complex 'lay-by' rule given in (46), which unrounds certain cases of /ʊ/ to [ɨ] until Vowel Shift has operated, whereupon [ɨ] is rerounded.

(46)

$$\begin{bmatrix}-\text{tense}\\+\text{high}\end{bmatrix} \dashrightarrow [-\text{round}] \;/\; \begin{bmatrix}-\text{nasal}\\+\text{ant}\\-\text{cor}\end{bmatrix} \left\{\begin{array}{ll} \text{l}\begin{Bmatrix}\text{l}\\ \#\end{Bmatrix} & \text{(a)}\\ \begin{bmatrix}-\text{ant}\\+\text{cor}\end{bmatrix} & \text{(b)}\end{array}\right\}$$

(SPE No.66, p.204)

'Lay-by' rules of this type have attracted a good deal of criticism as to their theoretical validity (see the essays in Goyvaerts and Pullum 1975); and in this case, quite apart from such general objections, the proposed rule "does not cover several exceptional cases of unrounding" (SPE, p.204), including *put, pudding* and *cushion*.

The SPE analysis of [jū] and related vowels suffers from one final problem; [j] has to be deleted by a later rule in certain dialects after dentals and palato-alveolars (SPE, p.231), giving [nū] *new*, [dūk] *duke*, etc.. Here, however, Chomsky and Halle are missing a generalisation; while some American English accents do indeed lack [j] after coronals (unless [ū] is unstressed), a fact perhaps better expressed by restrictions on the j-Insertion rule in such varieties, [j] never surfaces after /r w dʒ ʃ/, for instance, in any dialect. I shall suggest a possible solution to this dilemma below.

Some sample derivations illustrating the SPE system of rules discussed above are given in (47).

(47) SPE

	profound	profundity	reduce	reduction
Underlying:	/ū/	/ū/	/ʊ/	/ʊ/
Tensing/Unrounding:	–	–	ɨ̄	–
Trisyllabic Laxing:	–	ʊ	–	–
Vowel Shift:	ɔ̄	o	–	o
Rounding Adjustment:	ā	ʌ	–	ʌ
Diphthongisation:	āw	–	ɨ̄w	–
y-Preposing:	–	–	yɨ̄w	–
Re-rounding:	–	–	yūw	–
Surface:	āw	ʌ	yūw	ʌ

	cube/venue	ambiguity	ambiguous
Underlying:	/ʊ/	/ʊ/	/ʊ/
Tensing/Unrounding:	ɨ̄	ɨ̄	ɨ̄
Diphthongisation:	ɨ̄w	ɨ̄w	ɨ̄w
y-Preposing:	yɨ̄w	yɨ̄w	yɨ̄w
Re-rounding:	yūw	yūw	yūw

	tabular
Underlying:	ø
ø --> ʊ	ʊ
Tensing/Unrounding:	ɨ̄
Diphthongisation:	ɨ̄w
y-Preposing:	yɨ̄w
Re-rounding:	yūw
ū --> [- tense]:	yʊ
Vowel Reduction:	yə

	push	pun
Underlying:	/ʊ/	/ʊ/
Unrounding:	ɨ	–
Vowel Shift:	–	o
Rounding Adjustment:	–	ʌ
Re-rounding:	ʊ	–
Surface:	ʊ	ʌ

4.4. Halle's (1977) Account

Halle (1977), chronologically the second of the studies under discussion here, is largely a revision of the SPE analysis of [jū], [ʌ] and [ʊ]. Halle attempts to remedy some of the inconsistencies, and to simplify the intricate derivations found in SPE. To this end, he restricts the Vowel Shift Rule to tense vowels, although these need not be stressed, and reformulates j-Preposing to operate before /ʌ̄/, or lax /ʌ/ in an open syllable. Sample derivations are shown in (48).

(48) Halle (1977)

	profound	profundity
Underlying:	/ɨ̄/	/ɨ̄/
Trisyllabic Laxing:	–	ɨ
ɨ --> [- high]:	–	ʌ
Vowel Shift:	$\bar{a}_t$	–
Diphthongisation:	$\bar{a}_t w$	–
Surface:	$\bar{a}_t w$	ʌ

	reduce	reduction	cube/venue
Underlying:	/ʌ̄/	/ʌ̄/	/ʌ̄/
-CC Laxing:	–	ʌ	–
y-Preposing:	yʌ̄	–	yʌ̄
Vowel Shift:	yɨ̄	–	yɨ̄
High Rounding:	yū	–	yū
Diphthongisation:	yūw	–	yūw
Surface:	yūw	ʌ	yūw

	study	studious	ambiguity	ambiguous
Underlying:	/ʌ/	/ʌ/	/ʌ/	/ʌ/
Pre-V Tensing:	–	–	ʌ̄	ʌ̄
CiV Tensing:	–	ʌ̄	–	–
y-Preposing:	–	yʌ̄	yʌ̄	yʌ̄
Vowel Shift:	–	yɨ̄	yɨ̄	yɨ̄
High Rounding:	–	yū	yū	yū
Diphthongisation:	–	yūw	yūw	yūw
Surface:	ʌ	yūw	yūw	yūw

	tabular
Underlying:	∅
ʌ-Insertion:	ʌ
y-Preposing (before lax /ʌ/ in open σs):	yʌ
Vowel Reduction:	yə

	push	pun
Underlying:	/ʊ/	/ʌ/
= Surface:	ʊ	ʌ

Halle may have made some improvements in the treatment of [jū] (his [yūw]), [ʌ] and [ʊ]; as noted above, he no longer derives surface [ʌ] from /ʊ/ via Vowel Shift, but from underlying /ʌ/. Similarly, he derives [ʊ] directly from /ʊ/ - this equivalence of underlying and surface representations is especially appropriate since /ʊ/ never participates in morphophonemic alternations. Halle no longer requires the SPE Rounding Adjustment rule, and his derivations make more use of independently necessary tensing and laxing rules rather than the SPE tensing and unrounding process formulated especially for /ʊ/.

However, Halle's analysis presents a number of problems of its own. For instance, he introduces two non-surfacing, abstract vowels, /ɨ̄/ and /ʌ̄/, which are additionally suspect in belonging to the cross-linguistically rare category of back unrounded vowels, into the underlying system. This does allow Halle to treat the *reduce* - *reduction* and *study* - *studious* alternations, as well as *profound* - *profundity*, as resulting from the regular operation of the Vowel Shift Rule in one member of each pair, but in order to do so, he must posit two additional absolute neutralisation rules to round /ɨ̄/ and lower /ɨ/ to [ʌ]; these rules are reproduced in (49) and (50).

(49) $\begin{bmatrix} \text{+ syl} \\ \text{+ back} \\ \text{+ high} \end{bmatrix} \longrightarrow [\text{+ round}]$

(Halle 1977, p.621, No.26)

(50) $\begin{bmatrix} \text{+ back} \\ \text{- round} \\ \text{- long} \end{bmatrix} \longrightarrow [\text{- high}]$

(Halle 1977, p.623, No.31)

Halle also assumes that both *ambiguous* and *ambiguity* have underlying /ʌ/, which in both cases undergoes Prevocalic Tensing and Vowel Shift. This derivation is possible only if the Vowel Shift is generalised to all tense vowels, regardless of stress, since [jū] in *ambiguity* is stressed but this is not true in *ambiguous*. However, Halle's revised formulation of Vowel Shift has one major drawback; this concerns forms like *various* and *managerial*. The SPE derivations for these are given in (51).

(51)

Underlying:	væri+ous	mænægér+i+æl
Pre-V Tensing:	værī+ous	mænæger+ī+æl
CiV Tensing:	vǣrī+ous	mænægēr+ī+æl
Vowel Shift:	vērī+ous	mænægīr+ī+æl
Diphthongisation:	vēyrīy+ous	mænægīyr+īy+æl

As SPE restricts the Vowel Shift Rule for tense vowels to those which are also [+ stress], Chomsky and Halle have no difficulty in explaining the failure of /ī/ to shift in both *various* and *managerial*, even though it tenses and diphthongises in both cases: the vowel is unstressed, and therefore ineligible for Vowel Shift. Halle, on the other hand, does not indicate how these vowels are to be stopped from shifting. A late tensing rule might be suggested, but since some cases of tensing must be ordered before Vowel Shift to provide a suitable input for the latter, as in *Canadian* or *variety*, and since all tensing rules are ordered well before Vowel Shift in SPE, I find it hard to see how such a rule might be formulated. It does not seem feasible to extract any context from the main Tensing Rule and order it after Vowel Shift, as the shifting and non-shifting vowels are often subject to tensing in substantially the same environment (so, *various* and *variety* both show Prevocalic Tensing of /I/), and differ only in the presence or absence of stress on the relevant vowel.

It seems, then, that the Vowel Shift Rule must be restricted to stressed vowels; but if this is so, Halle will be unable to derive [jū] from /ʌ/ in *ambiguous*. Halle's account is further compromised by the difficulty of deriving [jū] in words like *habitude*, *credulity* and *credulous*. Here, we find the same augment which is present in *ambiguous* and *ambiguity*, so that the same underlying representation, /ʌ/, should be appropriate. However, neither CiV Tensing nor Prevocalic Tensing can operate in *credulity*, etc., so that /ʌ/ cannot be tensed and shifted in such forms. Nor can Halle's account deal adequately with items like *angular* and *tabular*. Here, /ʌ/ is inserted by rule and the second expansion of Halle's y-Preposing rule, which inserts /j/ (= /y/) before lax /ʌ/ in an open syllable, will then operate. Since no tensing rule is appropriate in such cases, and the /ʌ/ vowel is unstressed, Vowel Reduction can subsequently take place, producing [jə]. However, as Chomsky and Halle (SPE, p.197) observe, the pronunciation [tæbjələ(r)] is only one variant: we must also allow for "fairly careful speech, in which the medial vowel is rounded" (SPE, p.197). Yet Halle has no way of deriving phonetic [tæbjʊlə(r)].

Finally, Halle's y-Preposing rule itself (Halle 1977, p.621, No.27) is problematic. This rule is designed to insert /j/ (Halle's /y/) before all instances of tense /ʌ̄/, and before lax /ʌ/ when it occurs in an open syllable. The restriction to open syllables is intended to exclude *pun*, *luck*, *but* and similar forms from the domain of y-Preposing. However, as Rubach (1984, p.36) notes, a number of words like *butter*, *fussy* and *mussel* arguably have /ʌ/ in an open syllable but no [j], although Halle's rule predicts that [j] should appear in these items. Rubach observes that:

"the only way to exclude these words from j-Preposing is to posit underlying geminates. This is hardly a solution, since the geminates would serve no purpose other than to block j-Preposing" (1984, p.36).

These difficulties cumulatively suggest that, although Halle (1977) makes a number of minor improvements on the SPE analysis of [jū], [ʌ] and [ʊ], the revised model cannot claim to constitute a net gain.

4.5. Rubach's (1984) Account

As Halle (1977) based his treatment of [jū] and related vowels on SPE, so Rubach (1984) in turn attempts to improve on Halle's study. Rubach retains some elements of Halle's analysis, such as the underlying /ɨ̄/ vowel in *profound* - *profundity*, but also makes some significant departures from the earlier work.

Like Halle, Rubach proposes /ʌ/ as the underlying vowel in *study* - *studious* and *Lilliput* - *Lilliputian*, but /ʌ̄/ in *reduce* - *reduction*, *punish* - *punitive* and so on. Rubach holds that, if underlying /ʊ/ and /ū/ were preferred, the grammar would be seriously complicated on two counts:

- to account for the appearance of [ʌ] in *reduction*, *study*, etc., we would require a special rule deriving [ʌ] from /ū/.
- the tense [ū] in *studious*, *Lilliputian* can be derived via CiV Tensing if the underlying vowel is /ʌ/, but not if it is /ʊ/, since in SPE, CiV Tensing does not apply to high vowels.

Rubach consequently formulates his j-Preposing rule (1984, p.32) to operate before tense /ʌ̄/, inserting /j/ in *reduce*, *studious*, *Lilliputian* and *punitive*, but correctly excluding *reduction*, *study*, *Lilliput*, *punish*, *pun*, *cut* and so on. In addition, Rubach assumes that this rule will insert /j/ in certain non-alternating forms like *mute*, *cucumber*.

Rubach's main departure from Halle's analysis concerns the augment in *ambiguous* and *ambiguity* and the inserted vowel in *tabular, angular*. As we saw above, Halle considers the augment to be /ʌ/; this will undergo Vowel Shift and High Rounding (see (48)). For *tabular*, Halle proposes /ʌ/-Insertion, open-syllable y-Preposing, and Vowel Reduction.

We have seen that the derivation of *ambiguous* and *tabular* cause difficulties for Halle: he must extend Vowel Shift to unstressed vowels to account for surface [jū] in the former, and cannot produce a rounded medial vowel in the latter. Rubach acknowledges these problems, and proposes that the Vowel Shift Rule be once again restricted to stressed tense vowels. However, he is then forced to assign underlying /v/ to *ambiguous* and *ambiguity*, and to insert /v/ in *tabular*, where Vowel Reduction may then optionally apply to give [jə] or [jū]. These uses of /v/ rather than /ʌ/ present Rubach, in turn, with two problems. First, if *ambiguous* and *ambiguity* both have underlying /v/, why does the tensed, stressed reflex of this vowel not undergo Vowel Shift in *ambiguity*? Secondly, how is /j/ to be inserted in any of these forms, given that Rubach's j-Preposing rule only applies before tense /ʌ̄/?

Rubach's solution to the first of these problems is to exclude /ū/ (and /ō/) from the domain of the Vowel Shift Rule: he approaches this solution obliquely, by considering forms like *hero* and *echo*. Since the Vowel Shift Rule is now restricted to stressed vowels, the final [ōw] of these forms must be derived from underlying /ō/ via Stem-Final Tensing and Diphthongisation rather than from vowel-shifted /ɔ̄/. However, this predicts that the related stressed vowels in *heroic* and *echoic* should shift to [ūw], and since they clearly fail to do so, Rubach proposes that /ō/ should be exempted from Vowel Shift. This restriction has further implications, since *pool, noon, doom,* etc., which in SPE and Halle (1977) have [ūw] derived from /ō/ by Vowel Shift, must now be stored with underlying /ū/; /ū/ in turn must be stopped from shifting, to prevent the derivation of [aw] in forms like *pool*.

The exclusion of /ū/ and /ō/ from Vowel Shift is of no great consequence for the characterisation of productive modern English phonological alternations: pairs of the *profound - profundity* type are not affected since these, according to Rubach, have underlying /ɨ̄/, and although we can no longer deal with *lose - lost, shoot - shot,* and also *fool - folly, school - scholar, food - fodder* and *poor - poverty,* both these sets of alternations are extremely small, and are undoubtedly better seen as the product of allomorphy rules for the first set, and as irregular, fossilised alternations in the case of the second. Furthermore, there is experimental evidence (Jaeger 1986, Wang and Derwing 1986), to be discussed more fully below, which suggests that modern English speakers no longer perceive these [ūw]-[ɒ] alternations to be part of the synchronic Vowel Shift pattern. Such evidence provides further justification for Rubach's decision to remove /ū/ and /ō/ from the scope of the Vowel Shift Rule: he accomplishes this exclusion by adding the specification [- round] to the upper subrule, as shown in (52).

(52) Vowel Shift

$$\begin{bmatrix} + \text{tense} \\ + \text{stress} \end{bmatrix} \longrightarrow \left\{ \begin{array}{ll} [-\alpha \text{ high}] & \begin{bmatrix} \text{----} \\ \alpha \text{ high} \\ - \text{low} \\ - \text{round} \end{bmatrix} \\ & \\ [-\beta \text{ low}] & \begin{bmatrix} \text{----} \\ \beta \text{ low} \\ - \text{high} \end{bmatrix} \end{array} \right\}$$

(Rubach 1984, p.35, No.27)

As for the second of Rubach's problems, [j] is generated in *ambiguous, ambiguity* and *tabular* by a rule of j-Insertion (Rubach 1984, p.36) which applies before lax /ʊ/. Rubach notes that this rule might be thought to predict the occurrence of surface [j] in *put, push,* *bullet, soot* and the like, but he is in fact able to avoid inserting /j/ in these forms by making j-Insertion a cyclic rule. Consequently, j-Insertion will fail in *put, push*, etc., since these are morphologically simplex and /ʊ/ is morpheme-internal and appears underlyingly: in lexicalist terms, these constitute underived environments for the rule. However, /j/ will be inserted in *ambiguous* and *ambiguity*, where /ʊ/ is an augment; in *architecture*, where /ʊ/ is again part of a separate morpheme, this time the suffix /-ʊr/; and in *tabular* and *angular*, which will also be derived environments by virtue of the earlier insertion of /ʊ/. Rubach's derivations of these forms, and the other examples discussed above, are given in (53).

(53) Rubach

	profound	profundity
Underlying:	/ɨ̄/	/ɨ̄/
Trisyllabic Laxing:	-	ɨ
ɨ --> [- high]:	-	ʌ
Vowel Shift:	ā	-
Diphthongisation:	āw	-
Surface:	āw	ʌ

	reduce	reduction	cube/venue
Underlying:	/ʌ̄/	/ʌ̄/	/ʌ̄/
-CC Laxing:	-	ʌ	-
j-Preposing:	jʌ̄	-	jʌ̄
Vowel Shift:	jɨ̄	-	jɨ̄
High Rounding:	jū	-	jū
Diphthongisation:	jūw	-	jūw
Surface:	jūw	ʌ	jūw

	study	studious
Underlying:	/ʌ/	/ʌ/
CiV Tensing:	-	ʌ̄
j-Preposing:	-	jʌ̄
Vowel Shift:	-	jɨ̄
High Rounding:	-	jū
Diphthongisation:	-	jūw
Surface:	ʌ	jūw

	ambiguous	ambiguity	tabular
Underlying:	/ʊ/	/ʊ/	∅
ʊ-Insertion:	–	–	ʊ
j-Insertion:	jʊ	jʊ	jʊ
Pre-V Tensing:	jū	jū	–
Vowel Reduction:	–	–	jə or jʊ
Diphthongisation:	jūw	jūw	–
Surface:	jūw	jūw	jə or jʊ

	push	pun
Underlying:	/ʊ/	/ʌ/
= Surface:	ʊ	ʌ

The discussion above, however, has not dealt with all the problems raised by Rubach's analysis. For instance, although Rubach succeeds in excluding *put, push* and other forms with surface [ʊ] from undergoing his j-Insertion rule, it is not clear how he is to derive *blue, rude*, etc., which have the same surface [ūw] as *ambiguous, reduce* and *cube* but lack [j]. On the other hand, Rubach admits that he is unable to generate [j] in words like *copula* and *population* (1984, p.37, fn.15), and has to assume that the glide is present lexically in these forms. In addition, Rubach requires two rules, j-Preposing and j-Insertion, to perform what seems intuitively to be a single process, and his analysis still relies on absolute neutralisation and the non-surfacing vowels /ɨ̄/ and /ʌ̄/ in the derivation of *profound - profundity, reduce - reduction, mute, tutor* and *cucumber* (and presumably also *cube* and *venue*).

4.6. Halle and Mohanan's (1985) Account

In the last of the studies to be considered here, Halle and Mohanan (1985) acknowledge their debt to Rubach (1984), and retain substantially the same derivations as Rubach for the *profound - profundity, reduce - reduction* and *study - studious* types of alternation. They also derive [ʌ] in *gun, but*, etc. directly from /ʌ/, and [ʊ] in *put, push* from /ʊ/. However, HM make a major departure from the assumptions of earlier analyses in their treatment of the [yūw]/[jū] sequence in non-alternating forms like *cube, music, residue, avenue, statue* and *venue*.

HM's analysis of [jū] in these words follows largely from their formulation of the Vowel Shift Rule, which they restrict to long, rather than tense vowels. Like Halle (1977), HM drop the requirement that vowels should be stressed in order to shift, and accordingly are forced "to attribute the vowel alternation in *various - variety, impious - pious* and *maniac - maniacal* to a special rule that lengthens the stressed vowel in a number of specially marked words" (HM 1985, p.81). This ad hoc rule of Prevocalic Lengthening (which HM treat as a process quite distinct from the remarkably similar Prevocalic Tensing rule) is necessary only to account for cases which would be readily explicable by restoring the restriction of Vowel Shift to stressed long/tense vowels.

HM also propose that the English Main Stress Rule should be made sensitive to vowel length: it follows that the presence or absence of stress can be one indicator of underlying vowel length, and therefore of the eligibility of a vowel for Vowel Shift. Since HM do not assume any version of the Alternation or Naturalness Conditions (Kiparsky 1973, 1982; Postal 1968) or Mohanan's hypothesis that underlying and lexical representations should be equivalent in non-alternating forms, and since SCC does not hold for rules like Vowel Shift which apply on Level 2 of the lexicon, the presence or absence of alternations is of no consequence to them in divining the operation of the Vowel Shift Rule.

HM rely on their hypothesis regarding the interdependence of vowel length, stress and the Vowel Shift Rule to argue that the vowels which surface as [jū] in the examples in (54) and (55) "cannot be identical in underlying representation, but become identical (save for stress)" due to Vowel Shift (HM 1985, p.90).

(54)	argue	issue	statue	venue
	ague	tissue	virtue	menu

(55)	cube	music	putrid	beauty
	revenue	residue	avenue	
	absolute	hypotenuse	substitute	

The argument which leads to this unexpected conclusion runs roughly as follows. In (54), the word-final vowels are stressless and must therefore be underlyingly short; [ju] cannot, therefore, be derived via Vowel Shift, and the underlying vowel must be [+ high], since the surface vowel is [+ high]. HM propose that the appropriate underlier in these cases is /ɨ/, which will subsequently undergo Stem-Final Lengthening and Tensing. However, in the words in (55), the vowel surfacing as [jū] "is long and must therefore have undergone Vowel Shift. Since [yūw] is [+ high], its pre-Vowel Shift source must be [- high]" (HM 1985, p.90). HM conclude that, in (55), [yūw]/[jū] is derived from /ʌ̄/, which will shift to [ɨ̄]. y-Insertion (HM 1985, p.90, No.93) is formulated to operate before high back unrounded [ɨ̄] and [ɨ]. Lax [ɨ] must then be lowered in closed syllables, to give surface [ʌ] in *sulphur*, *profundity* and so on, while lax [ɨ] in open syllables and tense [ɨ̄] in all cases are rounded. One final extra rule of ɨ-Lengthening, which applies to stressed short /ɨ/, is also posited to account for [jū] in *sulphuric*.

Derivations for the *profound* - *profundity*, *reduce* - *reduction*, *study* - *studious* and *sulphur* - *sulphuric* alternations, and for *cube*, *revenue* and *venue*, illustrating HM's special rules, are given in (56).

(56) Halle and Mohanan (1985)

	study	studious	sulphur	sulphuric
Underlying:	/ʌ/	/ʌ/	/ɨ/	/ɨ/
CiV Lengthening:	–	ʌ̄	–	–
Vowel Shift:	–	ɨ̄	–	–
ɨ-Lowering:	–	–	ʌ	–
ɨ-Lengthening:	–	–	–	ɨ̄
y-Insertion:	–	yɨ̄	–	yɨ̄
Diphthongisation:	–	yɨ̄w	–	yɨ̄w
ɨ-Rounding:	–	yūw	–	yūw
Vowel Reduction:	–	–	ə	–
Surface:	ʌ	yūw	ə	yūw

	profound	profundity
Underlying:	/ɨ̄/	/ɨ̄/
Trisyllabic Laxing:	–	ɨ
Vowel Shift:	ā	–
ɨ-Lowering:	–	ʌ
Diphthongisation:	āw	–
Surface:	āw	ʌ

	reduce	reduction	cube/revenue
Underlying:	/ʌ̄/	/ʌ̄/	/ʌ̄/
-CC Shortening:	–	ʌ	–
Vowel Shift:	ɨ̄	–	ɨ̄
y-Insertion:	yɨ̄	–	yɨ̄
Diphthongisation:	yɨ̄w	–	yɨ̄w
ɨ-Rounding:	yūw	–	yūw
Surface:	yūw	ʌ	yūw

	venue/statue
Underlying:	/ɨ̄/
y-Insertion:	yɨ̄
Stem-Final Tensing/Lengthening:	yɨ̄
ɨ-Rounding:	yū
Surface:	yū

HM's account of [jū] and the alternations in which it is involved must surely be the most complex and least satisfactory of the post-SPE studies considered here. The underlying vowel system constructed by HM contains more non-surfacing vowels, i.e. /ɨ/, /ɨ̄/ and /ʌ̄/, than those of either Halle (1977) or Rubach (1984), and HM also require more additional rules, in the form of ɨ-Lowering, ɨ-Lengthening and ɨ-Rounding, to effect the absolute neutralisations necessary in disposing of these non-surfacing segments. In addition, HM's logic in assigning different final underlying vowels to *revenue,* *avenue* and *residue* on the one hand, and *venue* and *statue* on the other seems flawed, for two reasons. First, I can discern no difference in stress between the final vowel of *venue* and that of *avenue*, yet stress is HM's major motivation for arguing that the first is underlyingly short and the second long. Secondly, although HM assert that the final vowels of *venue* and *avenue*, as well as the stressed vowel of *cube*, "become identical (save for stress)" (HM 1985, p.90) during the course of the derivation, a careful consideration of HM's ordered list of rules (p.100) shows that this cannot be so: [yūw] can indeed be derived from /ʌ̄/ in *cube* and *avenue*, via Vowel Shift, y-insertion, Diphthongisation and ɨ-Rounding, but there is no way of deriving [yūw] in *venue, statue*, etc.. The *venue* vowel can, however, surface in two different ways, according to dialect:

- In HM's Dialect D, final /ɨ/ will trigger y-Insertion and can then undergo ɨ-Rounding postlexically. However, since Dialect D shows no evidence of Stem-Final Tensing (see HM p.59), /ɨ/ cannot be tensed. Nor can it be lengthened stem-finally, since Stem-Final Lengthening (HM p.61, No.9) affects only tense back vowels in dialects other than B. In Dialect D, then, the word-final vowel in *venue* will surface, according to HM, as short high lax [jʊ].
- In Dialects A, B and C, /ɨ/ in *venue* will have [j] inserted, and will then be eligible for Stem-Final Tensing and Lengthening and postlexical ɨ-Rounding. However, although this will allow for surface [jū], the vowel cannot then undergo Diphthongisation to produce HM's [yūw], since Stem-Final Lengthening is listed as a Stratum 3 rule but Diphthongisation, which applies to long vowels, applies on Stratum 2.

It is clear, then, that HM cannot derive [yūw] vowels, "identical (save for stress)" (HM 1985, p.90) in *venue* and *statue* as well as *cube* and *avenue*. It seems also that HM will find difficulty in deriving [yūw] in *ambiguous* and *ambiguity* (which they mention only very briefly) and in *tabular* (which they do not mention at all). To take *tabular* first; if /ʌ/ is inserted, this cannot undergo Vowel Shift to [ɨ] since the medial vowel is unstressed and must therefore be underlyingly short and ineligible for Vowel Shift. However, if /ɨ/ is the vowel inserted, it can attract /y/ and undergo ɨ-Rounding, but cannot be lengthened, tensed or diphthongised. As for *ambiguous* and *ambiguity*, the only possible underlying vowel is again /ɨ/ (see the derivations in (57)).

(57)

	tabular	ambiguous	ambiguity
Underlying/Inserted:	/ɨ/	/ɨ/	/ɨ/
Pre-V Tensing:	–	ɨ̄	ɨ̄
y-Insertion:	yɨ	yɨ̄	yɨ̄
ɨ-Rounding:	yʋ	yū	yū

Again, however, [yūw] cannot be derived, since Diphthongisation affects only long vowels, and HM propose a rule of Prevocalic Lengthening only in a few lexically marked words such as *variety, maniacal* and *pious*. In any case, if Prevocalic Lengthening were permitted here, *ambiguity* would have to be listed with underlying /ʌ/, since the tensed, stressed, long vowel otherwise resulting could not be excluded from Vowel Shift. It seems that the best we can do in HM's system is to derive [jʋ] in *tabular* and [jū] in *ambiguous* and *ambiguity*, but as the surface facts demand [jū] (HM's [yūw]) obligatorily in *ambiguity* and at least optionally in *ambiguous* and *tabular*, the best in this case is clearly not good enough.

4.7. An Alternative Analysis

Having examined the derivation of [jū] and related vowels in SPE, Halle (1977), Rubach (1984) and Halle and Mohanan (1985), we must conclude that none of these analyses is adequate. All share a number of general theoretical problems; for instance, the last three include non-surfacing back unrounded vowels like /ɨ̄/, /ɨ/ and /ʌ̄/ in their underlying vowel systems (in SPE, /ɨ/ is not posited underlyingly but is produced during the derivation of [yūw]), and all involve absolute neutralisation, effected by various special rules. Remote underlying representations are frequently assigned to non-alternating forms, exploiting the 'free ride' principle, which might be paraphrased as "if it can be done, it must be done". These tendencies towards abstractness are particularly disappointing in HM (1985), as an exponent of Lexical Phonology, since other lexicalist theories, notably of syntax (see Hoekstra, van der Hulst and Moortgat 1981) aim to be maximally surface-oriented. It may be true that there is no way of imposing the Alternation or Naturalness Conditions (Kiparsky 1973, 1982; Postal 1968) or even their more recent cyclic and lexicalist congeners, the Elsewhere Condition and the Strict Cyclicity Condition (Mascaró 1976, Kiparsky 1982) as absolute prohibitions on the application in non-alternating forms of the core, Stratum 2 rules of English phonology; likewise, Mohanan's (1986) hypothesis that underlying and lexical representations for non-alternating forms should be equivalent is no more than a guideline. However, given the progressive lessening of abstractness in lexicalist syntactic theory, and current, parallel attempts to reduce phonological abstractness (Kiparsky 1982), the fact that we cannot at present impose these principles and constraints absolutely surely should not discourage phonologists from constructing rules and representations which are consistent with them. The existence of escape hatches does not oblige us to climb through them.

Quite apart from these general objections, all the analyses discussed above encounter more specific difficulties of derivation. SPE cannot account for [ʊ] in *cushion*; Halle predicts surface [j] in *butter* and cannot derive citation form pronunciations of *tabular* and *angular* with a medial rounded vowel; Rubach needs two rules to insert /j/ and still cannot produce a glide in *copula*, *population*; and HM, due to unacknowledged problems of rule-ordering, cannot derive [yūw] in *ambiguous*, *ambiguity*, *tabular* or *venue* words.

I shall now propose an alternative account of the derivation of [jū], [ū], [ʊ] and [ʌ], which will be more concrete and comprehensive, and account for both synchronic dialect variation and diachronic developments, as well as other types of external evidence such as speech errors, in line with the aim of LP, stated in Chapter 1 above, of producing analyses which accord with external as well as internal evidence. In this account, the surface vowels discussed above will be derived from three underliers: non-alternating [ʊ] in *push*, *put*, etc., will be derived from /ʊ/; non-alternating [ʌ] in *pun*, *but* words, and the [ʌ]-[jū] alternation in *study* - *studious* and *sulphur* - *sulphuric* from /ʌ/; and all other examples considered earlier, including *profound* - *profundity*, *reduce* - *reduction*, *cube*, *venue*, *ambiguous* and *tabular*, from underlying or inserted high back tense rounded /ū/ (see (58)).

(58)

/ʊ/	/ʌ/	/ū/	
pull	putt	profound -	profundity
push	butter	reduce -	reduction
bush	but	cube	ambiguous
cushion	couple	avenue	ambiguity
put	fund	statue	credulous
soot	duck	venue	credulity
	study - studious	accuse	shoe
	sulphur - sulphuric	huge	chew
		duke	woo
		tabular	rude
		angular	blue

This proposal inevitably raises numerous questions, which I shall attempt to answer below. The first innovation is perhaps the inclusion of /ū/ in the underlying RP/GenAm vowel systems, given that it has not figured prominently in recent studies. Halle (1977), Rubach (1984) and HM (1985) all exclude /ū/, regarding the high back rounded position as an accidental gap in the tense/long vowel system (although HM do suggest, not altogether convincingly, that /ū/ may be the source for [ɔI]). It is not hard to justify the reinstatement of /ū/, since a long or tense high back rounded vowel appears phonetically in so many varieties of English; furthermore, English did historically possess such a vowel underlyingly, and there seems to be no valid reason for assuming that it has been lost. The reintroduction of /ū/ produces the underlying vowel system for RP and GenAm (ignoring for the moment any discrepancies in the low vowel system) in (59), which may be compared with the HM (1985) system of (60).

(59)

short/lax		long/tense		diphthongs		
I	ʊ	ī	ū			
ɛ	ʌ	ē	ō	aI	aʊ	ɔI
æ	ɒ	ǣ	ɔ̄			

(60) HM (1985)

	$\begin{bmatrix} -\text{round} \\ -\text{back} \end{bmatrix}$ long	short	$\begin{bmatrix} -\text{round} \\ +\text{back} \end{bmatrix}$ long	short	$\begin{bmatrix} +\text{round} \\ +\text{back} \end{bmatrix}$ long	short
$\begin{bmatrix} +\text{high} \\ -\text{low} \end{bmatrix}$	ī	ɪ	ɨ̄	ɨ	–	ʋ
$\begin{bmatrix} -\text{high} \\ -\text{low} \end{bmatrix}$	ē	ɛ	ʌ̄	ʌ	ō	o
$\begin{bmatrix} -\text{high} \\ +\text{low} \end{bmatrix}$	ǣ	æ	–	a	ɔ̄	ɔ

I shall now turn to the insertion of /j/. Evidence was presented in Section 4.2. above in favour of an analysis of [j] in the [jū] sequence as an epenthetic onset consonant. I assume that there is a single j-Insertion rule, which inserts /j/ before all instances of tense /ū/ - this rule is given in (61).

(61) j-Insertion

$$\emptyset \dashrightarrow j \ / \ .(C) \ \text{---} \begin{bmatrix} +\text{high} \\ +\text{back} \\ +\text{round} \\ -\text{low} \\ +\text{tense} \end{bmatrix}$$

The operation of (61) is quite straightforward in words like *cube, huge, duke* and *ambiguity*, where the underlying vowel is /ū/ and only j-Insertion is required to produce the correct surface form. I shall discuss the *reduce* - *reduction* and *study* - *studious* alternations separately below, but let us accept for the moment that /j/ can be inserted regularly in *reduce*, where /ū/ is present underlyingly, and in *studious*, where [ū] is derived from /ʌ/ via CiV Tensing, but will not affect *reduction* or *study*. As for *ambiguous, credulous, habitual* and *tabular, angular*, I propose that the augment in the former set of words, and the inserted vowel in the latter, are both tense /ū/. Previous analyses have generally assumed both to be lax, but as we have seen, this leads to difficulties in deriving a medial rounded vowel in careful pronunciations of *tabular*, and may also bar the derivation of tense long [jū] in *credulity* since there is no tensing context here as there is in *ambiguity*. If *ambiguous*, *credulity* and *tabular* all have /ū/, /j/ will automatically be inserted by the j-Insertion rule in (61). Furthermore, to account for the fact that the final vowel in *venue* and *avenue* tends to be pronounced shorter or laxer than [jū] in *cube*, and similarly that *ambiguous* and *tabular* have shorter medial vowels than *ambiguity*, I shall adopt in essence Rubach's (1984, p.49) proposal that a rule of u-Laxing operates whenever /ū/ is unstressed, although this process might be better formulated as shortening /ū/ while leaving it tense. It should be noted that this u-Laxing rule is independently necessary to account for the distribution of palatalised and non-palatalised consonants (see Rubach 1984).

/j/, then, can be inserted in all the cases where [jū] (or [jʊ]) surfaces, using a single rule of j-Insertion before tense /ū/. However, we are still faced with the problem of stopping [j] from appearing in cases where [ū] <-- /ū/ appears with no preceding glide, as is the case in *woo, rude, shoe, blue* and *chew*. Halle (1977), Rubach (1984) and HM (1985) all fail to consider this problem, and in SPE it is rather inadequately dealt with by inserting /j/ and later deleting it context- and dialect-specifically. I prefer to treat these cases as exceptions to the j-Insertion rule, and to mark them as such in the lexicon.

A survey of [jū] and [ū] words in English initially suggests that such exception-marking may not be feasible: of a total of 1833 [jū] and [ū] words in the Penguin English Dictionary (with sets of related word-forms sharing a lexical morpheme counted as one), 1234 have [jū], and 599, or 32.7%, lack [j]. Obviously, an exception rate of almost one third is too high.

However, this calculation does not take into account any phonotactic restrictions on /j/. In fact, the distribution of /j/ is extremely restricted:

1. It occurs only in syllable onsets.
2. It appears only as the second member of CC onset clusters, and even then only after a certain subset of other consonants. For instance, /j/ is impermissible after /r l w j/ and the palatals /ʃ ʒ tʃ dʒ/.
3. In CCC onset clusters, /j/ may appear only as the third consonant, and then only if C_1 is /s/ and C_2 is /p/, /t/ or /k/.

There are no counter-examples to these restrictions among the 1833 [jū] and [ū] words listed in the Penguin English Dictionary: [ū] is permissible after /r/, /w/ and /ʃ/, for instance, as in *rude, rumour, woo, wound, shoe* and *shoot*, but [jū] is not.

Two further points must be made in connection with restrictions on j-Insertion. The first concerns the insertion of /j/ after coronal consonants. In RP and Scots/Scottish Standard English, for instance, j-Insertion will operate after coronals, giving RP [djūk] *duke*, [tjūb] *tube*, [njū] *new* and Scots [dʒuk], [tʃub] after Palatalisation and j-Deletion. Thus, at least in Scots, *duke* and *juke(box)* will be homophonous, since the latter has an underlying initial palatal and /j/ consequently cannot be inserted for phonotactic reasons, while the former has initial /d/, and subsequent j-Insertion; /j/ then palatalises the preceding consonant. However, in certain varieties of American English, *duke, tube* and *new* are pronounced [dūk], [tūb] and [nū], although inserted [j] is present in *venue* [vɛnjū], *virtue* [vIrtjū] or [vIrtʃū] and *issue* [Isjū] or [Iʃū]. j-Insertion after coronals must therefore be restricted in GenAm to cases where the /ū/ vowel is unstressed (see HM 1985, p.90, No.93b) to account for this phonetic variation.

The second point concerns the validity of /lj-/ clusters, which Gimson (1980), for example, lists as acceptable, presumably on the basis of words like *lewd* [ljūd], *lure* [ljūr] or [ljʊə], and *lucid* [ljūsɪd]. If, however, /lj-/ is accepted as a permissible onset cluster, then for /lj-/ alone, there are more apparent exceptions, i.e. cases like *loom, loop, loose, lunar* and *lute,* in which [lū] (or [lʊw] in dialects with Diphthongisation) appears, than 'regular' cases with [j] - 82 as opposed to 66. I believe that these facts point to a more complex pattern of acceptability, and assume that */lj-/ is actually phonotactically excluded. However, /j/ can be inserted after /l/ if and only if /l/ can be resyllabified into the coda of the preceding syllable, leaving /j/ alone in the onset before /ū/. This generalisation accounts for the vast majority of [lū] and [ljū] words, leaving a total of only 27 exceptions, rather than 82, out of 148, and a number of these, including *lewd, lure, lurid* and *lucid* also have (arguably more common) alternative pronunciations without [j]. This proposal also accounts for the otherwise inexplicable pronunciations of *postlude* and *interlude* with [u] but *prelude* with [jū]; only in *prelude* can /l/ belong to the first syllable, and therefore it is only here that j-Insertion is applicable. It may be that the few forms which retain [lj] are the residue of an earlier period of the language when [lj] was generally acceptable; it seems to be the case that [lj] is now only common in conservative RP and with older speakers.

The phonotactic restrictions on j-Insertion noted above can be encoded in two ways. Either the rule itself can be complicated to exclude surface sequences of tautosyllabic *[rj], *[ʃj], *[wj] and so on, or a number of filters may be proposed, with the stipulation that the output of a lexical phonological rule may not contravene the phonotactic restrictions expressed by these filters. I shall adopt the latter course, and suggest the pan-English filters in (62).

(62)a.

$$* \begin{bmatrix} + \text{sonorant} \\ - \text{nasal} \end{bmatrix} \quad j \qquad *jj,\ *wj,\ *rj,\ *lj$$

b.

$$* \begin{bmatrix} + \text{coronal} \\ + \text{anterior} \\ + \text{strident} \end{bmatrix} \quad j \qquad *ʃj,\ *ʒj,\ *tʃj,\ *dʒj$$

In GenAm, it might be possible to modify the second filter, by removing the specifications [+ anterior, + strident], thus excluding *[tj], *[dj], *[sj], *[zj] and *[nj], although an additional condition restricting the filter to cases where stressed /ū/ follows would be necessary to permit [ávənjū] but not *[njū], and [Isjū] or [Iʃū] but not *[əsjūm]. However, this would wrongly predict that *[ʃj], *[ʒj], *[tʃj] and *[dʒj] would also be permitted in unstressed syllables. Alternatively, the filters in (62) might be allowed to stand for all varieties of English, including GenAm, and the j-Insertion rule could instead be modified for GenAm as shown in (63).

(63)

$$\phi \dashrightarrow j \ / \ . \ \langle \overset{C}{[+\ \text{cor}]} \rangle_a \ \text{---} \begin{bmatrix} + \text{high} \\ - \text{low} \\ + \text{back} \\ - \text{round} \\ \langle - \text{stress} \rangle_b \end{bmatrix}$$

If a, then b

An immediate problem with this approach concerns filter b. in (62), which will apparently be overridden by the Dissimilarity Condition, a positive word-formation condition shown in (64) (see also Selkirk 1984).

(64)

$$\begin{array}{ccc} & \text{onset} & \\ [-\ \text{son}] & & [+\ \text{son}] \end{array}$$

The Dissimilarity Condition will rule out *[rj] and *[lj], but also *[mj] and *[nj], as in *mute* and *newt*; and a well-formedness condition of this kind should not be violated by epenthesis rules.

However, within a Lexical model, this problem is easily overcome. There is evidence that the Maximal Onset Principle holds only on Level 1; for instance, in German *möglich* [møkliç] 'possible', the /g/ is retained in the initial syllable and not resyllabified, as evidenced by the operation of Syllable-Final Devoicing. Similarly, in English [kwIk.li], the [k] clearly is not resyllabified, since it surfaces with glottal reinforcement, although [kl-] is an acceptable onset. If this is so, then the Dissimilarity Condition, which is a constraint on the Maximal Onset Principle, should also 'switch off' after Level 1.

If we assume that roots are syllabified on Level 1, all subsequent apparent contraventions of the Maximal Onset Principle and/or the Dissimilarity Condition will arise through epenthesis rules, j-Insertion being one such case. I assume that j-Insertion operates on Level 2; the Maximal Onset Principle, and hence the related Dissimilarity Condition, will then no longer be operative when it applies. There will, however, be specific filters of the kind given in (62), which will hold throughout the lexicon, making instances of *[rj], *[wj], *[ʃj] and so on unsyllabifiable, and therefore underivable. j-Insertion can consequently be appropriately and adequately constrained using filters.

When apparent exceptions which in fact result from phonotactic constraints, and a number of obviously unassimilated loans, are excluded, the rate of actual exceptions to j-Insertion falls from 32.7% to only 8.7% of the total. I contend that an exception rate of less than one in ten is not unreasonable (in fact, this rate might be reduced even further by excluding, for instance, [gj], which seems to occur only marginally in e.g.

gules), and that words like *boot, cool, doom, goose, hoot, noon* and *tooth*, which might be expected to have [ju] but actually lack [j], should be marked [- j-Insertion] in their lexical entries. Recent evidence that speakers prefer to maximise storage and minimise computation (Jaeger 1986, pp.73-76) certainly supports an approach using a common underlying vowel, a single rule and a limited degree of exception-marking, as opposed to an analysis setting up one underlying vowel in *duke* and *tune* and another in *doom* and *tooth*, or using a 'lay-by' rule to remove [ū] words from the scope of j-Insertion (in the unlikely event that a common context for such a rule could be found). As Jaeger (1986, p.75) observes:

> "There is little evidence that speakers will perform abstract linguistic analyses for the sake of 'simplicity' or to save memory space; on the contrary they show preferences for transparent, albeit uneconomical and exception-filled, analyses."

It is true that there are a number of loan-words lacking [j] in a context where it would be predicted that j-Insertion should operate; these include *sushi, Suzuki, jacusi* and *voodoo*. However, these are paralleled by a number of loans of longer standing which have been assimilated and now undergo j-Insertion, such as *cupid* and *tuna* (which, interestingly, has an alternative form *tunny* [tʌni], exactly the alternation predicted by the model presented here and in Chapter 3). It seems that speakers perceive words like *sushi, Suzuki* as 'foreign', and that such unassimilated loans will not be eligible for processes of the native English phonology. Incidentally, it is not clear that HM's alternative account would fare better in predicting the lack of [j] in the Japanese loans discussed here: since Japanese has no /ū/, but does have /ɨ̄/ in these words, and since there seems to be no reason why these should be borrowed into English with /ū/ rather than HM's /ɨ̄/ (unless, perhaps, the purported English /ɨ̄/ is being used merely as a diacritic for j-Inserting versus non-j-Inserting items), words like *sushi* and *Suzuki* must be prime candidates for j-Insertion in the HM model; but [j] fails to appear.

Furthermore, when speakers first encounter a word in its orthographic form, some confusion can arise as to whether [j] should be inserted or not; thus, I have heard *coup* and *houmus* pronounced [kjū] and [hjūməs]. This erroneous j-Insertion is also observable in native words; so, the Scottish place-names *Cupar* [kupər] and *Kirkcudbright* [kIrkubri] are sometimes (mis)pronounced [kjūpə] and [k3kjūbri] by Southern English speakers who have seen but not heard them. Again, such errors are generally corrected when speakers hear the word in question. This phenomenon of overgeneralisation seems to support the hypothesis that the absence of j-Insertion is learned in connection with particular words. It is also notable that many of the native words lacking [j], like *food, cool, moon, boot* and *tooth*, are common lexical items: this may account for the lack of 'regularisation' of these forms to the j-Insertion pattern, since it is well known that frequently occurring words are less apt to undergo regularising, analogical change than less common items. For instance, the Old English strong verbs which have not been assimilated to the general weak verb pattern, remaining strong in modern English, tend to be those which occur most frequently.

We have established, then, that all instances of surface [ū], with or without [j], are derived from underlying /ū/, with the exception of [jū] in the environment for CiV Tensing, as in *studious, Malthusian, Lilliputian*, etc., to which I shall return below. First, I must address the problem of why /ū/ in *reduce, cube, avenue, ambiguity, ambiguous, tabular, blue* and *doom* does not surface as [aʌ]. That is, how is Vowel Shift to be prevented from applying in these forms, as it should in all cases regardless of whether it affects tense or long vowels, and in most even if it is restricted to stressed vowels? For the moment, I shall follow Rubach (1984) in excluding /ū/ and /ō/ from the input to the Vowel Shift Rule - the exclusion of individual segments or classes of lexical items (like those with the *father* vowel considered in Section 3. above) should not, however, be regarded as an ideal solution, and I shall return to the Vowel Shift Rule in Chapter 3. As we saw above, Rubach presents evidence which suggests that these vowels cannot be allowed to shift; *hero* and *echo* must have underlying final /ō/, which will undergo Stem-Final Tensing and/or Lengthening, but cannot shift to [ū] because, for independent reasons, Vowel Shift must be restricted to stressed vowels. However, this means that /ō/ must be excluded from Vowel Shift, since otherwise stressed /ō/ in *heroic* and *echoic* would become [ū]; in turn, *pool, noon* should be represented with underlying /ū/, since they cannot now be assigned /ō/ and undergo Vowel Shift. It follows that /ū/ cannot be allowed to shift, since *pool, noon* would otherwise be expected to surface with phonetic [aʊ].

Rubach's proposal is thus in line with my analysis, and has the additional advantage of ruling out free rides through Vowel Shift for back vowels. In earlier studies, such as SPE, any word with surface [ū], alternating or not, had to be shifted from /ō/, and similarly [ō] from /ɔ̄/. Now, however, non-alternating forms like *rose* can be listed lexically with /ō/, and *pool, duke* with /ū/, and the only words with phonetic [ō] but underlying /ɔ̄/ will be members of alternating pairs like *verbose* - *verbosity* or *hypnosis* - *hypnotic*. There is a certain cost, in that we can no longer deal with the alternations shown in (65), but since these are by no means numerous, and are arguably better analysed synchronically as fossilised, or as the output of allomorphy rules, this loss is amply compensated for by the reductions in abstractness resulting from the modification of the Vowel Shift Rule.

(65)	lose - lost	fool - folly
	shoot - shot	poor - poverty
		food - fodder
		school - scholar

There are two further pieces of evidence which support the exclusion of /ū/ and /ō/ from the synchronic Vowel Shift Rule. The first is historical: in Older Scots and other Northern Middle English dialects, /ū/ and /ō/ did not participate in the Great Vowel Shift, suggesting that these may represent in some sense the 'weakest' subpart of the Vowel Shift (see Chapter 4). The second is psycholinguistic: several recent experiments which aimed to discover whether speakers 'know' the Vowel Shift Rule and which alternations they include in the Vowel Shift set have concluded that, while the [aI] - [I], [ī] - [ɛ], [ē] - [æ] and [ō] - [ɒ] alternations do have some measure of psychological reality for modern English speakers, [aʊ] - [ʌ], from /ū/, and [ū] - [ɒ], from /ō/, apparently do not. For instance, in a productivity experiment carried out by Wang (1985), in which speakers were presented with nonsense words as adjectives and required to derive a related noun in *-ity*, with a shifted vowel, only the alternations [aI] - [I], [ī] - [ɛ], [ē] - [æ] and [ō] - [ɒ] showed any strength. Similar results were obtained in a concept-formation experiment reported in Wang and Derwing (1986). Such experiments are designed to ascertain which elements informants perceive as part of a specific group. In this case, speakers were encouraged to form a Vowel Shift concept by answering 'yes' to the core Vowel Shift alternations given above, and 'no' to "anti-vowel shift" (McCawley 1986) pairs like [aI] - [ɛ] and [ī] - [æ]. The informants were then asked to extend this classification to novel stimuli, and did not respond positively to tokens of the [aʊ] - [ʌ] and [ū] - [ɒ] alternations.

A second glance at (65) will show that my exemplification of the small number of alternations which can no longer be related by Vowel Shift consisted solely of instances of [ū] - [ɒ] from underlying /ō/; I have not included [aʊ] - [ʌ] from underlying /ū/. However, in concept-formation experiments conducted by Wang and Derwing (1986) and Jaeger (see McCawley 1986, p.33, and (66) below, for results), informants also consistently failed to include [aʊ] - [ʌ] in the category they had been taught. In fact, in Jaeger's experiment, speakers' percentage acceptability responses were often lower than for alternations to which they had been trained to respond negatively (see (66)). However, in (58), I listed *profound* - *profundity* in the column of words with underlying /ū/. In view of the evidence reviewed above, motivating the exclusion of /ū/ from Vowel Shift, how can the appearance of phonetic [aʊ] in *profound* be explained?

(66)

% affirmative responses to examples of:

Trained affirmative:	
[aɪ] - [ɪ]	93
[ī] - [ɛ]	88
[ē] - [æ]	80
[ō] - [ɒ]	87.5
Trained negative:	
Tense-lax same height	25
Distinct lax vowels	8
Distinct tense vowels	20
Identical vowels	17
Other tense-lax pairs	13
Not included in training sessions:	
[aʊ] - [2]	9
[jū] - [ʌ]	75

The first point to note here is that, although the [aʊ] - [ʌ] alternation was historically a result of the Great Vowel Shift, at least in the South (see Chapter 4), there are suggestions that the synchronic Vowel Shift Rule may no longer include all those vowels that participated in the diachronic change, and indeed, that it may no longer be a purely phonetically motivated process. For instance, Wang and Derwing (1986) and

McCawley (1986) argue that the Vowel Shift alternations [aI] - [i], [ī] - [ɛ], [ē] - [æ] and [ō] - [ɒ] may be reinforced for modern English speakers due to their correspondence with the English Spelling Rule, since these pairs of vowels are normally spelt ‹i›, ‹e›, ‹a› and ‹o› respectively. The synchronic Vowel Shift Rule would then be partially orthographically motivated. Jaeger (1986, p.86) goes further here, claiming that "the source of speakers' knowledge about these vowel alternations is a combination of orthography and the frequency with which given alternations occur". If these are indeed the criteria according to which alternations are included in or excluded from the synchronic Vowel Shift Rule, then [aʊ] - [ʌ] clearly fails on both counts, since the phonological members of the alternation do not correspond to a single letter in the orthography ([aʊ] is usually spelt ‹ou› and [ʌ], ‹u›), and since there are, again, very few examples of the alternation in present-day English. Halle (1977) gives a complete list of examples, consisting of eight pairs of words, of which the last two at least are almost certainly no longer productively phonologically related (see (67)).

(67)

profound - profundity	pronounce - pronunciation
abound - abundant	announce - annunciation
South - Southern	denounce - denunciation
flower - flourish	tower - turret

It may be, then, that at least some speakers no longer regard [aʊ] and [ʌ] as related via Vowel Shift; since, as I argued above, there should be provision in the modern English vowel system(s) for underlying diphthongs, there is no difficulty in assuming that these speakers store *profound* with /aʊ/ and *profundity* with /ʌ/. However, some speakers might still perceive [aʊ] and [ʌ] as in some sense related, and we might accommodate these by proposing that they derive *profound* and *profundity* from /ū/, and that a limited number of lexical items with underlying /ū/, notably *abound, profound, announce, denounce, pronounce*, be marked [+ Vowel Shift]. This does not materially affect the conclusion reached above that /ū/ does not generally form part of the input to Vowel Shift; and the experimental evidence cited above, which indicated that speakers do not seem to include [aʋ] - [ʌ] in the vowel shift 'concept' is consistent with the fact that very few alternations are involved and with the different orthographic representations which are characteristic of [aʋ] and [ʌ]. Furthermore, proposing that [aʋ] and [ʌ] in *profound* and *profundity* are derived from /ū/ (for some speakers) should not give rise to any learnability problem. While Jaeger (1986, p.78) is concerned that

"in the case of the [Halle and Mohanan 1985] analysis, there are a number of difficult points for the child, including the fact that surface [ʌ] can be derived from three different underlying tense vowels (and the underlying lax vowel /ʌ/)",

in my account [ʌ] can be derived only from /ʌ/ or /ū/; and the fact that both [aʋ] and [(j)ū] may alternate with [ʌ] represents further evidence that all three should be derived from the same underlying vowel, as well as an aid to learnability for the child acquiring the language.

We can now derive [ʌ] and [jū] in non-alternating words, and [aʋ] in *profound, abound*, etc.. The final problem for the analysis presented here concerns the production of [jū] in *studious, Lilliputian* and [ʌ] in *profundity, reduction, study* and *Lilliput*.

We can reasonably assume that the underlying vowel in *study* and *studious* is lax /ʌ/, which surfaces in *study* since no further rules are applicable in this context, but which will undergo CiV Tensing and j-Insertion in *studious*. Conversely, there is no tensing context in *reduce* or *profound*, but in *reduction* and *profundity* the vowels surfacing as [ʌ] are eligible for -CC Laxing and Trisyllabic Laxing respectively, so that the underlying vowel in these cases is /ū/. However, since tensing and laxing rules are normally assumed not to affect the height of a vowel, laxing of /ū/ would be expected to produce [ʊ] rather than [ʌ], while tensing of /ʌ/ should give [ʌ̄], not [(j)ū].

It is interesting to note, however, that the first of these predictions at least is borne out by dialect studies. In certain Northern and North Midland dialects, for instance, /ʌ/ is entirely lacking, so that [ʊ] appears in all non-alternating words in which RP would have [ʊ] or [ʌ], and also replaces [ʌ] in alternating forms like those in the right-hand column of (68).

(68) [ʊ]

push	pun	study
pull	but	reduction
cushion	duck	profundity

As (68) shows, laxing of /ū/ in *reduction* and *profundity* does indeed produce [ʊ] in these dialects, as predicted above. Concomitantly, *study* can be assumed to have underlying /ʊ/ rather than /ʌ/ in Northern dialects, and this will undergo CiV Tensing in *studious* to give [(j)ū]. This is, however, another problem, since in SPE and subsequent work (see especially Rubach 1984, pp.32, 40) the rule of CiV Tensing is restricted to non-high vowels; and /ʊ/ is, of course, [+ high]. However, it seems that high vowels are excluded in the literature solely on the basis of the front vowel: and SPE gives examples only for /I/, as shown in (69).

(69) [I], NOT [aI]

SPE: punctilious, Darwinian, reptilian, vicious
Rubach: artificial, prejudicial, avaricious

In all probability, /ʊ/ as well as /I/ was excluded from the scope of CiV Tensing, by the addition of the specification [- high], simply on the grounds of economy; tensing of /ʊ/ was achieved in SPE by a special tensing and unrounding rule designed to produce [ɨ̄], so that applying CiV Tensing to /ʊ/ was never necessary. Since there seems to be no empirical reason for excluding /ʊ/ from CiV Tensing, I propose that the rule should be applicable to all vowels save /I/.

An analysis deriving *study - studious* from /ʊ/ and *reduce - reduction* from /ū/ can, then, account for dialects which lack /ʌ/, and in which [ʊ] rather than [ʌ] alternates with [aʊ] and [(j)ū]: it is not clear how HM, for example, would deal with the facts of such varieties. However, my analysis predicts that the Northern dialects represent the unmarked case, whereas in reality a relatively small proportion of English dialects lack /ʌ/; in RP, Scots/Scottish Standard English and many (if not all) American English dialects, [ʌ] alternates with [aʊ] and [(j)ū] while /ʊ/ never participates in morphophonemic alternations. We must therefore find some way of explaining the situation in the majority of dialects where /ʌ/ is present as well as in the minority where it is not.

In fact, the Northern dialects with /ʊ/ but not /ʌ/ do, in one sense, represent the unmarked case. That is, they are typical of the Middle English situation. At this stage of the language, only /ʊ/ was present in the short vowel system (see Chapter 4); orthoepical evidence for (probably allophonic) lowering and unrounding of /ʊ/ to [ʌ], with [ʊ] retained between a labial and another consonant, as in *pull, push, woman* and *wood*, first becomes available around 1640 (Dobson 1957, p.93). Dobson attributes the retention of [ʊ] after labials to the lip position of /w p b f/ acting against the lip spreading required for [ʌ]; however, he notes that "the rounding influence acted sporadically and produced inconsistent results, as is evident from the common words *put, but, butcher* and *butter*" (1957, p.196). This eventually led to a phonemic split of /ʊ/ and /ʌ/, since "the PresE distinction between words with [ʊ] and words with [ʌ] shows no regularity; [ʌ] occurs in positions that should favour [ʊ] in *wonder, pun, puff...but, bulk* and *bulb*" (Dobson 1957, p.196).

Dialects with /ʌ/, such as RP, Scots/Scottish Standard English (which, conversely, lack /ʊ/ - see Chapters 4-6) and GenAm, are therefore in a historical sense more complex than the Northern English dialects, since the former have undergone an additional sound change and innovated an extra phoneme, /ʌ/, in most words in which the conservative Northern dialects have /ʊ/. Reflecting the fact that these historical developments have complicated the synchronic system of alternations (which are relatively straightforward in dialects without /ʌ/, where back vowel alternations of [ʊ] and [(j)ū] parallel front vowel alternations of [I] and [aI]), I propose that we should complicate the tensing and laxing rules in varieties with /ʌ/. To derive [ʌ] in *profundity, reduction* and *assumption*, I assume that, when /u/ undergoes Trisyllabic or -CC Laxing, it not only laxes but simultaneously lowers by one degree of height and unrounds. Conversely, when /ʌ/ undergoes CiV Tensing in *studious, Lilliputian* and *Malthusian*, a condition should be built into the rule so that /ʌ/ does not only tense, but also raises to [+ high] and rounds; the rounding in this case might be correlated with marking conventions, although this possibility has not yet been investigated. Sample derivations are given in (70).

(70)

	profound	profundity	reduce	reduction
Underlying:	/ū/	/ū/	/ū/	/ū/
Laxing/lowering/ unrounding:	–	ʌ	–	ʌ
Vowel Shift:	ā	–	–	–
j-Insertion:	–	–	jū	–
Surface:	āʊ	ʌ	jū	ʌ

	ambiguous	ambiguity	cube/venue
Underlying:	/ū/	/ū/	/ū/
j-Insertion:	jū	jū	jū
u-Laxing/shortening:	jū/jʊ	--	--
Surface:	jū/jʊ	jū	jū

	study	studious
Underlying:	/ʌ/	/ʌ/
Tensing/raising/ rounding:	-	ū
j-Insertion:	-	jū
Surface:	ʌ	jū

	pun	push
Underlying: = Surface:	/ʌ/ ʌ	/ʊ/ ʊ

	tabular
Underlying:	∅
ū-Insertion:	ū
j-Insertion:	jū
u-Laxing/shortening:	jū/jʊ
Optional V reduction:	jə
Surface:	jū/jʊ/jə

There is one possible objection to the analysis above as developed so far, and this again involves psycholinguistic evidence on the synchronic reality of the Vowel Shift Rule. I do not treat [(j)ū] - [ʌ] as a vowel shift alternation, and have cited psycholinguistic evidence (from Jaeger 1986, Wang and Derwing 1986, and McCawley 1986) to support the exclusion of /ū/ and /ō/ from the input to Vowel Shift. It is true that evidence from Jaeger (1986) and others suggests that speakers no longer perceive [aʊ] - [ʌ] and [ū] - [ɒ] as related via Vowel Shift, although historically these alternations did result from the operation of the Great Vowel Shift. However, the same concept formation experiments (see Jaeger 1986, Wang and Derwing 1986 and (66) above) indicate that speakers do include [(j)ū] - [ʌ] in the Vowel Shift set, although this is not historically a vowel shift alternation and is not derived via the Vowel Shift Rule in the synchronic analysis presented above.

Jaeger (1986, p.86) argues that the derivation of alternations using the synchronic Vowel Shift Rule no longer depends solely on which vowel pairings resulted from the Great Vowel Shift; instead, modern English speakers are influenced by the frequency of alternations and their conformity with the English Spelling Rule - that is, whether both phonological members of a given alternation correspond to a single orthographic representation. Consequently, certain alternations like [ū] - [ɒ] and [aʊ] - [ʌ], which were originally derived via Vowel Shift, are no longer perceived as part of the Vowel Shift set, since they are infrequent and do not conform to the English Spelling Rule.

I contend that the opposite also holds: as the motivation for Vowel Shift changes, it not only comes to exclude alternations which were included at an earlier stage of the language, but also to include alternations which did not involve the historical Great Vowel Shift. This is the case with [(j)ū] - [ʌ], which is historically an alternation of tense and lax vowels of the same height, albeit complicated by the lowering of /ʊ/ in some dialects. As a relatively frequent alternation, with both elements commonly spelt <u>, involving a tense and a lax vowel of different heights, [(j)ū] - [ʌ] could easily conform to the Vowel Shift template internalised by some speakers. This is the first indication that synchronic phonological rules need not, and perhaps cannot be identical to their historical sources in a constrained lexical model, and although I shall not pursue the matter here, I shall return to it in Chapter 3, in a more extended discussion of the modern English Vowel Shift Rule.

The analysis presented above, and the associated underlying English vowel system given in (71), are clearly more concrete than those of Chomsky and Halle (1968), Halle (1977), Rubach (1984) and Halle and Mohanan (1985), which were reviewed above. In (71), I have reduced a number of possible underlying systems for different varieties of modern English to a single system for illustrative purposes; thus, /ɒ/ is bracketed since it may not appear in GenAm, while /ǣ/ and /ɑ̄/ are given as mutually exclusive options; see the discussion of the *father* vowel in Section 3 above.

(71)

short		long		diphthongs
ɪ	ʊ	ī	ū	
ɛ	ʌ	ē	ō	aɪ aʊ ɔɪ
æ	(ɒ)	ǣ/ɑ̄	ɔ̄	

In this Chapter, I have shown that the mechanism of LP can be reduced for English to two lexical levels, with the first cyclic and the second postcyclic, and with no recourse to loops between levels. This restriction reduces abstractness to some extent, and further reductions are possible if we adopt guidelines like Mohanan's (1986) hypothesis that underlying and lexical representations should be identical in the absence of alternations. Due to these restrictions, the system above contains no non-surfacing vowels, and can perhaps also claim greater learnability, not only because remote underliers are set up only on the basis of alternations, but because surface vowels in general have fewer sources. For instance, in HM's model, [ʌ] had one lax source, /ʌ/, and the three tense sources /ʌ̄/, /ɨ̄/ and /ū/ or /ǖ/, whereas here [ʌ] is derived only from /ʌ/ or /ū/. The account of [(j)ū] given above is also more consistent with available psycholinguistic evidence and can more readily incorporate further external evidence, such as synchronic dialect variation and the incorporation of complexities caused by discrepant historical developments. The analysis proposed here therefore accords better with the aims of Lexical Phonology outlined in Chapter 1.

There are, nonetheless, residual problems. In the discussions of Vowel Shift above, I succeeded in resolving the problems of 'free rides' for back vowels, but only by excluding particular vowels or classes of lexical items from the scope of the rule. This rather ad hoc treatment is due to the location of the core rules of the English vowel phonology, including the Vowel Shift Rule, on Level 2 of the lexicon, where they are beyond the domain of constraints like the Elsewhere and Strict Cycle Conditions; any constraining therefore depends on ad hoc devices and/or the goodwill of phonologists in accepting guidelines such as the identity of underlying and surface representations in non-alternating forms. I shall attempt to remedy this rather unsatisfactory situation in Chapter 3.

Chapter 3

Applying the Constraints: A Reanalysis of the Modern English Vowel Shift Rule

1. Introduction

The last chapter represented a preliminary attempt to constrain Lexical Phonology. The abstract model of Halle and Mohanan (1985) was reduced to a two-stratum lexical component (as well as a postlexical level). Wherever possible, Mohanan's (1986) guiding principle that underlying and lexical representations should be identical in non-alternating forms was adhered to; this will essentially mean that abstract underliers and derivation by lexical rule will be permitted only where alternations are present, thus ruling out 'free rides'. For cyclic lexical rules, operating on Level 1, this constraint follows from the Strict Cycle Condition (SCC; Mascaró 1976, Kiparsky 1982). For Level 2 rules, which are outside the domain of the SCC, Mohanan's principle would have to be stated as a separate constraint: nonetheless, I attempted in Chapter 2 to produce analyses in accordance with this principle. Such analyses are characterised not only by a lack of free rides, but by an absence of absolute neutralisation and non-surfacing underlying segments, as well as greater coherence with external evidence: it was argued in Chapter 1 that LP should aim to be consistent with historical, dialectological, psycholinguistic and error evidence, as well as the internal evidence usually appealed to in generative phonology.

Adherence to these various principles and constraints was perhaps particularly clear in the reanalysis of j-Insertion proposed above. The primary evidence for the rule of j-Insertion did concern alternations of [jū] with [ʌ], but the form of the derivation was decided with reference to historical and dialectal evidence. An epenthesis rule was proposed, since [j] appears after [m v], which do not otherwise cluster, and j-Insertion was assumed to operate in underived environments and in the absence of alternations only because evidence from speech errors and false j-Insertion in loans was available. Underlying forms were no more different from the eventual surface forms than was strictly necessary, so that all cases of [(j)ū] were derived from /ū/ or /ʌ/, rather than from non-surfacing /ɨ̄ ɨ ʌ̄/ via a number of 'lay-by' rules (see Halle and Mohanan 1985).

Despite these attempts at constraint, the account of the Vowel Shift Rule (VSR) in Chapter 2 is inadequate. Certainly, the analysis incorporated a number of moves towards reducing abstractness, such as the inclusion of the diphthongs /aɪ aʊ ɔɪ/ in the underlying vowel system and the exclusion of /ɨ ɨ̄ ʌ̄/ from it. Furthermore, it was claimed that one of the most striking advantages of the revised account of VSR is that it removed the problem of 'free rides' for the back vowels. However, this is only half a step forward, for two reasons. First, the solution does not extend to the front vowels (with the exception of the diphthong /aɪ/), so that VSR will still be allowed to apply in non-alternating forms like *fear, weird, pain* and *rain*; and second, the exclusion of free rides even in the back vowels is not due to any general principle, but arises almost accidentally from the inclusion of underlying diphthongs in the vowel system and the ad hoc removal of /ū ō/ from the set of input vowels to VSR. If we are to claim significant advances in the characterisation of vowel shift alternations, we should banish free rides altogether, and for some principled reason.

In this chapter, I shall propose a second revised account of the modern English VSR, which differs far more fundamentally from the historical Great Vowel Shift and from the SPE Vowel Shift Rule than did the version in

Chapter 2. The account elaborated below adheres to the principles that underlying and lexical representations should be identical in non-alternating forms, in the absence of external evidence to the contrary, and that free rides and absolute neutralisation should not be permitted, and is again consistent with synchronic, diachronic, dialectal and psycholinguistic evidence. It furthermore illustrates the hypothesis that synchronic rules can differ markedly from the historical changes which originally caused the variation they describe.

Finally, let me mention a problem with this new, more concrete version of generative phonology. Even given the constraints of LP, dubious cases will inevitably arise. For instance, alternations may exist in a language, but the time depth from the creation of these alternating forms may be so great, and the forms involved so few, that speakers may be unable to discern a synchronically productive pattern; the relation of such forms by rule would consequently be indefensible. There may never be a clear-cut dividing line between those alternations which may be derived by rule from a common underlier and those which are better treated as stored variants, but the adoption of a more concrete phonology may make the division easier. I shall show below that a less abstract formulation of VSR clarifies the difficult area of supposed 'regularity' in certain classes of the modern English strong verbs.

2. VSR and the Strict Cycle Condition

The hypothesis that the phonology of Present-Day English incorporates a synchronic analogue of the Middle English Great Vowel Shift, namely the Vowel Shift Rule (VSR), was first proposed in Chomsky and Halle (1968; SPE). Although VSR has subsequently been the focus of much theoretical argument (Goyvaerts and Pullum 1975), and various changes in its formulation have evolved over the years (see Halle 1977, Rubach 1984, HM 1985), the core of the original SPE rule remains, and VSR is generally accepted by proponents of post-SPE generative phonology.

In the light of increasingly serious attempts at constraining phonological rules, two major objections must be raised against the SPE version of VSR and its successors found in the more recent literature, both involving allegations of excessive abstractness. First, non-surfacing vowels and rules of absolute neutralisation are frequently proposed to ensure the proper application of VSR; for instance, HM (1985) posit back unrounded /ɨ ɨ̄ ʌ̄/ to produce surface [jū] via VSR (see Section 3.3. below). Secondly, VSR applies to non-alternating forms, which are given free rides through the rule. Thus *divine*, which alternates with *divinity*, will be listed with a remote underlying vowel, but so will non-alternating forms like *bee, house, pine, road, pain* and *cube*. The consequence of this is that, in SPE, all tense or long vowels are stored underlyingly in a form distinct from their surface realisations. The plausibility of this assumption, which entails the hypothesis that children learning modern English internalise what is basically a Middle English vowel system (with the addition of various underliers which equally did not surface in Middle English) has been questioned elsewhere (cf. here again the essays in Goyvaerts and Pullum 1975, and also Zwicky 1970, 1974).

Although VSR, as proposed in SPE, applies to all tense, stressed vowels, thus creating the problem of free rides, the rule is motivated only in alternating morphemes, given the principles discussed in Section 1 above. So, the supposed output of VSR is observable in *divine* because of the existence of related *divinity*, in which no shift has taken place. Similarly, the alleged operation of VSR in *sane, verbose, comedian* and *variety* is evidenced by the absence of its results in *sanity, verbosity, comedy* and *various*. There can be no analogous direct evidence of Vowel Shift in non-alternating forms like *bee, pain* and *road*, and consequently there is no motivation for assigning abstract underliers to such forms, and for deriving the surface vowels via VSR.

If the problem of free rides is to be solved, then, we must crucially find some way of restricting VSR to members of alternating pairs of words like those in (1).

(1)

a.	b.
various - variety	divine - divinity
comedy - comedian	serene - serenity
courage - courageous	sane - sanity
study - studious	assume - assumption
harmony - harmonious	verbose - verbosity
	(fool - folly; see 3.1.)
	(profound - profundity; see 3.1.)

VSR might be appropriately constrained by invoking the Alternation Condition (Kiparsky 1973, 1982), which in effect restricts neutralisation rules to alternating morphemes. However, Kiparsky (1982, p.36) rejects this constraint on the grounds that it "is not interpretable as a formal condition on grammars"; every derivation of a phonology must be checked for its coherence with the Alternation Condition. What is required is an analogous principle without the disadvantages of the Alternation Condition; and such a constraint is available within LP, in the form of the Strict Cyclicity Condition (SCC).

The function of the SCC (Kean 1974, Mascaró 1976, Kiparsky 1982) is to restrict the operation of cyclic rules to derived environments, where a derived environment is created by the addition of a morpheme or the application of a preceding feeding phonological rule on the same cycle (2).

(2) SCC: Cyclic rules apply in derived environments. An environment is derived for rule A in cycle (i) iff the structural description of rule A is met due to a concatenation of morphemes at cycle (i) or the operation of a phonological rule feeding rule A on cycle (i).

SCC can be imposed on the grammar as a formal condition on the proper application of cyclic rules, and is furthermore derivable, as Kiparsky (1982) and Giegerich (1988) argue, from the more general Elsewhere Condition. SCC must be the obvious candidate for a suitable constraint on VSR.

Whatever the hypothetical desirability of constraining VSR using the SCC, however, this seems impracticable. Lexicalist analyses of English phonology (see especially HM 1985) have so far classified VSR as a non-cyclic, Level 2 process, precisely in order to exempt it from the requirements of SCC, since the majority of forms traditionally supposed to undergo Vowel Shift, like *divine, sane* and so on, constitute underived environments for VSR: they show no concatenation of morphemes, and no phonological rule feeding VSR has applied. However, this is again to ignore the fact that VSR is only motivated in alternating pairs of words; if VSR could be made applicable only to the derived members of these pairs, it could be ordered on Level 1 within the domain of SCC, and the problem of free rides would disappear.

The restriction of VSR to derived environments is unproblematic for the forms in (1a). If we assume that VSR applies to tense, stressed vowels, the capitalised vowels in *varIous, comEdy, courAge, stUdy* and *harmOny* will be ineligible for shifting. However, in the right-hand members of the pairs in (1a), each of the corresponding vowels has undergone one of the tensing rules, which are triggered by affixation and in turn feed VSR. Examples are given in (3).

(3)

	comedy	comedian	various	variety
Underlying:	/ɛ/	/ɛ/	/I/	/I/
Pre-V Tensing:	-	-	ī	ī
CiV Tensing:	-	ē	-	-
VSR:	-	ī	-	aI

In the alternating pairs in (1b), however, it is the underived form which contains the tense, stressed vowel in each case; the derived form contains a short or lax vowel. Relocation of VSR on Level 1, subject to SCC, therefore commits us to a fundamental revision of the Vowel Shift Rule: the single rule shifting tense vowels will be replaced by two rules, one for tense vowels ($\bar{V}$SR) and the other for lax vowels ($\check{V}$SR). As noted above, $\bar{V}$SR will be fed by the tensing rules; similarly, derived environments for $\check{V}$SR will be created by the laxing rules - Trisyllabic Laxing in *divinity*, Suffix Laxing in *satiric*, and so on.

Although all laxing rules are ordered on Level 1 in English (see HM 1985), not all the tensing rules are cyclic. As shown in (4), CiV Tensing and Prevocalic Tensing both feed $\bar{V}$SR.

(4) Prevocalic Tensing:
various - variety
algebra - algebraic
impious - piety
maniac - maniacal

CiV Tensing:
manager - managerial
Canada - Canadian
comedy - comedian
courage - courageous
harmony - harmonious
Mongol - Mongolian

However, the other major tensing rule, Stem-Final Tensing, does not feed $\bar{V}$SR, as is evident from the fact that *vary* has final tensed [ī], but that this vowel has not shifted to [aI]. Consequently, Stem-Final Tensing will be ordered on non-cyclic Level 2, after the operation of VSR; in HM (1985) Stem-Final Tensing was a Level 3 rule, but it was argued in Chapter 2 above that the English lexicon should have only two levels.

In HM (1985), CiV Tensing is taken to be a cyclic, Level 1 rule, ordered after Trisyllabic Laxing since *Jordanian, Mendelian, Newtonian* and others meet the structural description of both rules and surface with a tense vowel: this is consistent with the account presented here. However, the ordering of Prevocalic Tensing is rather more controversial.

HM (1985) order Prevocalic Tensing on non-cyclic Stratum 2, yet it apparently feeds VSR in forms like *maniacal*, as shown in (5).

(5)

	[[mēnIæk]æl]
Trisyllabic Laxing:	ɛ
$\breve{\text{V}}$SR:	æ
Pre-V Tensing:	ī
$\bar{\text{V}}$SR:	aI
Output:	[mænaIəkḷ]

In *maniacal* both VSRs operate, the lax-vowel rule affecting the [ɛ] previously laxed by Trisyllabic Laxing, and the tense-vowel rule shifting the [ī] tensed by Prevocalic Tensing. However, Prevocalic Tensing must also be allowed to apply in forms like *maniac*; since this is generally regarded as an underived form, Prevocalic Tensing must be a non-cyclic Level 2 rule. Now, although $\breve{\text{V}}$SR could operate before Prevocalic Tensing, $\bar{\text{V}}$SR must crucially be ordered after this tensing rule, which feeds it, and if Prevocalic Tensing is on Level 2, $\bar{\text{V}}$SR must apply later on the same level. If $\bar{\text{V}}$SR is to be reinstated on Level 2, we lose the restriction to derived environments, which provided the initial motivation for splitting VSR into tense and lax subrules. It seems that we have gained a rule without losing the free ride problem.

There are two possible solutions to this difficulty. Prevocalic Tensing could be regarded as a rule applying to derived forms on Level 1, and subsequently in underived environments on Level 2, in the manner suggested by Borowsky (1986) for Velar Softening. The rule would then affect *various, variety, algebraic, notorious, notoriety* and *maniacal*, all of which constitute derived environments for Prevocalic Tensing, on Level 1, but will not apply in underived *maniac* until Level 2. Thus, the vowels prevocalically tensed on Level 1 in *variety, notoriety, algebraic* and *maniacal*, which are also stressed, will correctly undergo Level 1 V̄SR. Alternatively, Prevocalic Tensing could be ordered only on Level 1, and the troublesome form *maniac* could be regarded as derived: indeed, this assumption seems to be necessary if we are to treat *manic, mania, maniac* and *maniacal* as related and derived from a common base. I propose that this common underlier is /mēn-/ or /mēnI-/, to which is added the suffixes /-Ik/, /-Ia/, /-Iak/ and /-æl/; if we select the stem /mēnI-/, the double /II/ resulting from some of these suffixations might presumably be degeminated. The stem vowel /ē/ will then surface unchanged in *mania* and *maniac*, reduce when unstressed in *maniacal*, and undergo Suffix Laxing and subsequent V̆SR to give [æ] in *manic*. The final /I/ will be subject to Prevocalic Tensing when /-Ia/ or /-Iak/ is added, but only the stressed and tensed /I/ in *maniacal* will be eligible for V̄SR. Prevocalic Tensing can, then, be restricted to Level 1, at least for those cases when it must feed the V̄SR. Vowel Shift can again be located on Level 1 and thus made applicable only in derived environments.

The possibility of shifting lax vowels is mentioned by McCawley (1986), who reports that Chomsky and Halle considered a lax-vowel VSR in the early 1960s, before replacing this with the tense-vowel VSR published in SPE. In their earlier version,

"...tense vowels retain their underlying heights and lax vowels shift their heights (in the opposite direction from the shift that tense vowels undergo in ... SPE)" (McCawley 1986, p.30).

The derivations predicted by this VSR are given in (6), but will be amended below (see Section 3).

(6)

Tense vowels:	/ǣ	ī	ē	ɔ̄	ū	ō/
Diphthongisation:	ǣy	īy	ēy	ɔ̄w	ūw	ōw
Other rules:	āy			āw		
Lax vowels:	/æ	I	ɛ	ɒ	ʊ	o/
V̆SR (a):	ɛ	–	æ	o	–	ɒ
V̆SR (b):	I	ɛ	–	ʊ	o	–
Other rules:				ʌ	ɒ	

Whereas Chomsky and Halle first proposed a vowel-shift rule for lax vowels, then adopted instead a rule shifting tense vowels, the account presented here assumes that both V̄SR and V̆SR (formulated in (7)) are synchronic rules of modern English; neither cyclic rule alone would be sufficient to account for the data in (1). The inevitable allegations of rule duplication and missed generalisations must, however, be weighed against the solution to the problem of free rides which is supplied by splitting VSR and ordering both rules on Level 1, in the scope of SCC: some complication of the grammar is necessary in the interests of the principles of Chapter 1. However, I believe that minor formal complications are far less important than the greater goal of producing a grammar which adheres as closely as possible to the principles and constraints of LP; in other words, the optimal grammar is not necessarily the simplest and most elegant, but the one which coheres best with both internal and external evidence, and in which the central rules especially are bound by the constraints of the theory.

If we accept the bipartite VSR outlined above, all non-alternating forms, and the underived members of alternating pairs of words, will be represented underlyingly with their surface vowels: *pool* will be /pūl/, *bean* /bīn/, and *sane* /sēn/. Nor are we imputing an excess of computational mental agility to the modern English speaker; we need only assume that speakers 'know' that certain patterns of alternation exist, involving certain pairs of surface vowels (so that, if [ī] alternates, it will be with [ɛ], and likewise [ō] with [ɔ] and [aI] with [I]), and that the vowel selected as the appropriate underlier by the speaker is the surface vowel of the underived form. Related derived words will be subject to either tensing or laxing, and will then be eligible for the appropriate VSR.

(7)

a. V̄SR

$$\begin{bmatrix} \text{V} \\ +\ \text{tense} \\ +\ \text{stress} \end{bmatrix} \text{---->} \left\{ \begin{array}{l} [-\ \alpha\ \text{high}]\ /\ \begin{bmatrix} \text{------} \\ \alpha\ \text{high} \\ -\ \text{low} \end{bmatrix} \\ \\ [-\ \beta\ \text{low}]\ /\ \begin{bmatrix} \text{------} \\ \beta\ \text{low} \\ -\ \text{high} \end{bmatrix} \end{array} \right\}$$

b. V̆SR

$$\begin{bmatrix} \text{V} \\ -\ \text{tense} \\ +\ \text{stress} \end{bmatrix} \text{---->} \left\{ \begin{array}{l} [-\ \alpha\ \text{low}]\ /\ \begin{bmatrix} \text{------} \\ \alpha\ \text{low} \\ -\ \text{high} \end{bmatrix} \\ \\ [-\ \beta\ \text{high}]\ /\ \begin{bmatrix} \text{------} \\ \beta\ \text{high} \\ -\ \text{low} \end{bmatrix} \end{array} \right\}$$

Interestingly, the SCC makes precisely the correct predictions here, accounting for the absence of V̆SR in *damnable* and *solemnity* and V̄SR in *obesity* and *notify*, although these forms initially look problematic. Consider *solemn* - *solemnity*. If the underlying representation is /sɔlɛmn/, and if *solemnity* is derived from this by affixation on Level 1, it would be expected to be eligible for Level 1 rules, including V̆SR. However, if V̆SR did apply, the result would be *[sɒlæmnIti]. Conversely, to produce [sɒlɛmnIti] after V̆SR, the underlier would have to be /sɒlImn/, which would give the wrong surface vowel in the underived form. The same applies to *obesity*, which might be expected to surface as [ōbaIsIti] by V̄SR.

Let us approach this problem by returning to the notion of 'derived environment' embodied in the SCC (2). Although both VSRs appear to operate consistently in morphologically complex environments, it is not the addition of a morpheme per se which sanctions VSR, since neither Vowel Shift Rule demands a structural description which can be satisfied by morpheme concatenation. Both 'ask for' a specific type of segment to apply to, but this environment is purely phonological - [+ tense] vowels for V̄SR, and [- tense] ones for V̆SR. This contrasts with the case of Trisyllabic Laxing, for instance, which requires a certain combination of segments to follow the focus vowel, namely $C_0V_iC_0V_j$, where V_j is not metrically strong (Kiparsky 1982, p.35), and also CiV Tensing, which operates if the sequence /CiV/ follows the focus vowel. Both these configurations can be provided by adding a Class I affix, so all that is required for the proper application of a cyclic tensing or laxing rule is the presence of an underlying lax vowel to tense, or vice versa, and the provision of an appropriate context through the addition of some affix with the correct specifications, to satisfy SCC. Level 1 tensing rules will supply the feature [+ tense], feeding V̄SR by providing necessary phonological information on the same cycle. Likewise, laxing rules will specify vowels as [- tense], and these will then be eligible for V̆SR. SCC thus accounts for the lack of Vowel Shift in *obesity, notify, damnable* and *solemnity*. *Obesity* and *notify* are exceptions to Trisyllabic Laxing, and have tense, stressed vowels underlyingly and on the surface. The structural description of V̄SR is met at the underlying level, but SCC blocks its application here, and no information relevant to either VSR is introduced in the course of the Level 1 derivation. Conversely, *damnable* and *solemnity* have lax vowels at all stages of the derivation, and SCC will consequently block V̌SR.

The behaviour of vowels in morphologically derived words which do not undergo tensing or laxing is therefore consistent with the confinement of VSR to Level 1, where it will be appropriately constrained by SCC.

In the rest of this Chapter, I shall examine some potential problems for the account of Vowel Shift sketched above. In Section 3, problematic aspects of the lax-vowel V̌SR are discussed; these include the derivation of the *divine* - *divinity* alternation, the generation of the high and low back vowels, and the analysis of [jū]. In Section 4, I shall consider difficulties for any VSR operating on Level 1, concerning interacting rules and the modern English strong verbs, which present a test case as to how far the formulation of Vowel Shift proposed here itself constrains the adoption of abstract underlying representations; I shall also return briefly to the question of the appropriate underlying systems of low vowels for RP and GenAm, which was left partially unanswered in Chapter 2.

3. Problems for Lax-Vowel VSR

3.1. The high and low back vowels

A lax-vowel VSR of the type proposed by McCawley (1986) will produce the derivations in (8) for underlying high and low back vowels.

(8)

	/ʊ/	/ɒ/
V̌SRa:	–	o
V̌SRb:	o	ʊ
Other rules:	ɒ	ʌ

Although /ō/ will regularly lax to [o], and shift to [ɒ] in the *verbose* - *verbosity* alternation, V̆SR alone is insufficient to derive [aʊ] - [ʌ] and [ū] - [ɒ]: extra rules are needed to produce [ʌ] and [ɒ] (and also [aʊ]). These two alternations were also problematic for 'traditional' VSR, and are those which, according to recent experimental evidence (Jaeger 1986, Wang and Derwing 1986), are not subsumed under the VSR generalisation by modern English speakers. In addition, a very small number of alternating pairs is involved; these are listed in (9).

(9) [aʊ] - [ʌ]

profound - profundity		pronounce - pronunciation
announce - annunciation		denounce - denunciation
South - Southern	flower - flourish	tower - turret

[ū] - [ɒ]

shoot - shot	lose - lost	school - scholar
poor - poverty	fool - folly	food - fodder

In the majority of these cases, it is surely questionable whether the members of the pairs are perceived as synchronically related by any productive phonological process, although they may be linked in morphological and/or semantic terms. This point is especially relevant for the strong verbs, *lose* - *lost* and *shoot* - *shot*. Attempts to deal with strong verb alternations using phonological rules (see HM 1985) serve to indicate that these can be more adequately captured using allomorphy than by deriving these verbs through large numbers of phonological rules, often set up expressly for this purpose. I shall return to the strong verbs in 4.2. below, and will discuss there two recent conceptions of allomorphy, those of Halle (1977) and Lieber (1982). Whichever treatment of allomorphy is adopted, we no longer need to invoke VSR for strong verb alternations, including *shoot* - *shot* and *lose* - *lost*; this removes from consideration perhaps the only remotely convincing cases of the [ū] - [ɒ] 'vowel shift' alternation.

The [aʊ] - [ʌ] and [ū] - [ɒ] alternations, then, occur so infrequently that they cannot justifiably be related by rule. In *profound - profundity* there is the additional problem of finding an appropriate underlying vowel. McCawley's brief account of V̌SR (1986) indicates that [aʊ] - [ʌ] is derived from /ɔ̄/, making this the only case where the vowels in the derived and underived forms both require further derivation after V̌SR (see (10)).

(10)

	profound	profundity
Underlying:	/ɔ̄/	/ɔ̄/
TSL:	-	ɒ
V̌SR:	-	ʊ
Diphthongisation:	ɔ̄w	-
Unrounding:	āw	ʌ

The *profound - profundity* alternation also requires the operation of Diphthongisation; I argued in Chapter 2 that this rule may be limited in many dialects (including at least some varieties of RP) to mid or mid and high monophthongs, and that in others, like Scottish Standard English, it does not operate at all. /ɔ̄/, then, does not seem to be a plausible underlier for [aʊ] - [ʌ], but is proposed simply to fit in with the version of V̌SR reported in McCawley (1986). It may well be preferable to store two allomorphs, /profaʊnd/ and /profʌnd-/, with the proviso that the latter is bound, and must either attract a Class I affix or, as a non-word root, not be derived beyond Level 1.

If we are to regard [aʊ] - [ʌ] and [ū] - [ɒ] as non-Vowel Shift alternations, it seems that we must exclude [ʊ] and [ɒ] from V̌SR. In fact, we shall see in the next section that only [ʊ] must be explicitly exempted, and then only in certain dialects. Since /ɒ/ will now appear underlyingly in *lost, folly,* etc., rather than being laxed from /ū/ and shifted, it will never be eligible for V̌SR.

3.2. The [(j)ū] - [ʌ] alternation

I have been assuming so far that the vowel underlying alternations like *assume* - *assumption* is /ū/, and my account of j-insertion in Chapter 2 was based on this hypothesis. However, there is no straightforward way of deriving [ʌ] from /ū/ by McCawley's V̌SR, as can be seen from (11).

(11)	assume	assumption
Underlying:	/ū/	/ū/
/-CC Laxing:	-	ʊ
V̌SRa:	-	o
V̌SRb:	-	ɒ
j-Insertion:	jū	-

There are two pseudo-solutions and two possible solutions to this problem. The pseudo-solutions would be to posit /ɔ̄/ in *assumption*, shift to to [ʊ] after laxing and unround it, or to reintroduce /ɨ̄/, rounding it in *assume* and laxing and shifting it to [ʌ] via V̌SR in *assumption*. Neither alternative is very attractive. In the former case, although [ʌ] might be derivable from /ɔ̄/ (despite the fact that we have already ruled out such a derivation for [ʌ] in *profundity*), [jū] is not. So we must either propose extra rules to produce [ū] from /ɔ̄/, or posit one underlying vowel in *assumption* and another in *assume*, thus losing the principal generative phonological means of showing that the forms are related. This is clearly nonsensical, and the reintroduction of /ɨ̄/ is no more appealing. The motivation for the presence of such a vowel in the modern English system, and its consequences for learnability, have already been questioned (see Chapter 2), and although a certain degree of abstractness may be necessary to solve some phonological problems, here it would solve nothing: adding /ɨ̄/ to the system does not in any way explain the facts of dialects with [jū] - [ʊ], or help account for the historical divergence of varieties with /ʌ/ from those lacking it.

Having dismissed these possibilities, we should now turn to more enlightening solutions. The central problem here is whether *assume - assumption* and *study - studious* should be derived using VSR or not. In my analysis of the [jū] - [ʌ]/[ʊ] alternation in Chapter 2, I assumed a tense-vowel VSR from which /ū/ was excluded. In dialects lacking /ʌ/, /ū/ simply laxed to surface [ʊ] in e.g. *assumption*, and likewise /ʊ/ in *study* underwent CiV Tensing and j-Insertion to give [jū] in *studious*. However, in varieties with /ʌ/, /ʊ/ participates in no alternations: surface [ʊ] should therefore be derived from underlying /ʊ/ as far as possible. I proposed that, in dialects with /ʌ/, the tensing and laxing rules should be slightly complicated to lower and unround laxed /ū/ to [ʌ], and to raise and round tensed /ʌ/ to [ū].

This proposal can easily be adapted into a framework with V̌SR. /ʊ/, rather than /ū/, will be excluded from shifting, and again the required surface vowels can be derived by tensing or laxing with additional dialect-specific raising and lowering for varieties with /ʌ/. Again, the lowering and unrounding of /ū/ could be achieved via the laxing rules, or using a separate minor rule, which would however be ordered after V̌SR on Level 1, since it must be governed by SCC to stop non-derived items like *book, cook* with /ʊ/ and [ʊ] from surfacing with [ʌ]; the same applies for the raising and rounding of /ʌ/ in *studious*, which could be achieved by a subrule of CiV Tensing or a subsequent derived-environment-only rule. Clearly, although /ʊ/ must be excluded from V̌SR, /ʌ/ need not be, if we assume that [ʌ] is always derived from /u/ in V̌SR contexts, via [ʊ] which is itself excluded from V̌SR, and subsequently unrounded and lowered by a special rule operating after V̌SR. Again, we are accounting for the fact that in some dialects, [jū] alternates with [ʋ], and in others with [ʌ], without recourse to VSR (see (12)).

(12) Dialect A

	assume	assumption	study	studious
Underlying:	/ū/	/ū/	/ʋ/	/ʋ/
Level 1				
Laxing:	–	ʋ	–	–
Tensing:	–	–	–	ū
Level 2				
j-Insertion:	jū	–	–	jū

Dialect B

	assume	assumption	study	studious
Underlying:	/ū/	/ū/	/ʌ/	/ʌ/
Level 1				
Laxing:	–	ʋ	–	–
Tensing:	–	–	–	ʌ̄
V̆SR:	–	(excluded)	–	–
Lowering/Unrounding:	–	ʌ	–	–
Raising/Rounding:	–	–	–	ū
Level 2				
j-Insertion:	jū	–	–	jū

The second possibility is to derive the forms of Dialect B using VSR and a Rounding Adjustment rule, instead of the special Lowering/Unrounding and Raising/Rounding rules suggested above. In Dialect A, which lacks /ʌ/, /ʋ/ will still be exempted from V̆SR and the derivation of *assume, assumption, study* and *studious* will be as shown in (12), using only the tensing and laxing rules. However, in Dialect B, which has innovated /ʌ/, tensed [ʌ̄] will be rounded to [ō], then shift to [ū] via V̄SR, while laxed [ʋ] will shift to [o] and subsequently unround to [ʌ]. These Rounding Adjustments will be restricted to Level 1, and hence apply only to derived representations. In Dialect B, /ʋ/ will be permitted to undergo V̆SR, and /ʌ/ need not be explicitly excluded either, since it will never appear in the correct context for shifting to occur, being itself derived via V̆SR in *reduction* and *assumption*. Derivations are shown in (13).

(13) Dialect B

	assume	assumption	study	studious
Underlying:	/ū/	/ū/	/ʌ/	/ʌ/
Level 1				
Laxing:	–	ʊ	–	–
Tensing:	–	–	–	ʌ̄
ʌ̄-Rounding:	–	–	–	ō
V̌SR:	–	o	–	–
V̄SR:	–	–	–	ū
o-Unrounding:	–	ʌ	–	–
Level 2				
j-Insertion:	jū	–	–	jū

Each analysis has its advantages and disadvantages. The former perhaps captures the historical divergence of the two types of dialect more transparently, but the latter is more consistent with psycholinguistic evidence (Jaeger 1986, Wang and Derwing 1986) which suggests that speakers regard [jū] – [ʌ] as a synchronic vowel shift alternation. Both also involve additional rules. For the moment, I shall accept the second solution, deriving [jū] in *studious* and [ʌ] in *assumption* via VSR.

This choice is relevant to the question, raised in the previous section, of which vowels must be excluded from VSR. In fact, in dialects with /ʌ/, no explicit exclusion is necessary. [ū] and [ō] will never undergo V̌SR, since they never arise from the operation of a tensing rule on /ʊ/ or /ɒ/, while /ʊ/, /ʌ/ and /ɒ/ will effectively exempt themselves from V̌SR: /ɒ/ and /ʊ/ will appear only in underived forms, and [ʌ] in suitably derived environments will be created by V̌SR and Unrounding, and thus will never be eligible for V̌SR itself. In varieties lacking /ʌ/, only /ʊ/ need be excluded, to stop [ʊ], laxed from /ū/, shifting to [o] in *assumption*.

Although alternations of [jū] – [ʌ]/[ʊ] cannot be derived using the outline V̌SR given in McCawley (1986), this does not indicate a fault in the idea of VSR for lax vowels, but only in one formulation of it. If we accept that historical developments have created greater complexity for the synchronic generation of the [jū] - [ʌ] alternation than for other 'core' Vowel Shift pairs of vowels, and are willing to tolerate a small amount of extra machinery to capture the diachronic and dialectal divergence concerned, then [jū] - [ʌ] can indeed be derived in a framework with V̌SR. In dialects without /ʌ/, VSR will be irrelevant to the derivation of [jū] - [ʊ], presumably because an alternation must involve two surface vowels of different heights to be included in the Vowel Shift 'concept'.

3.3. The *divine* - *divinity* alternation

According to McCawley (1986), /æ/ undergoes V̌SR to [I], while /ǣ/, if not laxed, becomes [ay]. I assume that McCawley would therefore select /ǣ/ as the underlying vowel in *divine* - *divinity*, giving the derivations shown in (14).

(14)

	divine	divinity
Underlying:	/ǣ/	/ǣ/
TSL:	-	æ
V̌SR:	-	I
Diphthongisation:	ǣy	-
Backness Adjustment:	āy	-

/ǣ/ will not be adopted here as the underlier for the [aI] - [I] alternation, for the following reasons:

1. This would be the only case (excluding *profound* - *profundity* which, I have argued, represents a Great Vowel Shift alternation historically - with later developments of the lax vowel - but not a synchronic product of the Vowel Shift Rule) in which rules other than VSR apply invariably to both the derived and the underived form: /ī/ surfaces unchanged in *serene*, and /ē ō/, with Diphthongisation in some dialects, in *sane* and *verbose*, but /ǣ/ never surfaces without a quality change.

2. Deriving the stressed vowel of *divine* via Diphthongisation and some quality-changing rule like Backness Adjustment marks a return to the production of surface diphthongs from monophthongs and the prohibition of underlying diphthongs. For detailed arguments against this alleged ban on underlying diphthongs, see Chapter 2.
3. If /ǣ/ is the underlying vowel in *divine* and *divinity*, there is some conflict with the orthography, since <i> never represents surface [ǣ] or [æ].

I proposed in Chapter 2 that we should severely restrict the Diphthongisation rule and derive surface [aI aʊ ɔI] from underlying diphthongs. If this proposal is to be upheld, the underlying vowel in *divine* - *divinity* must be the diphthong /aI/. This assumption has several advantages: for instance, the underlying vowel is identical with the surface vowel in the underived member of the pair, and the pronunciation of the underlying vowel also reflects the 'name' of the vowel letter used in the spelling, removing any conflict with the orthography. In these respects, the [aI] - [I] alternation will then match the other regular Vowel Shift alternations, as shown in (15).

(15) divine /aI/ = <i> = [aI]
serene /ī/ = <e> = [ī]
sane /ē/ = <a> = [ē]
verbose /ō/ = <o> = [ō]
(and also reduce /ū/ = <u> = [(j)ū])

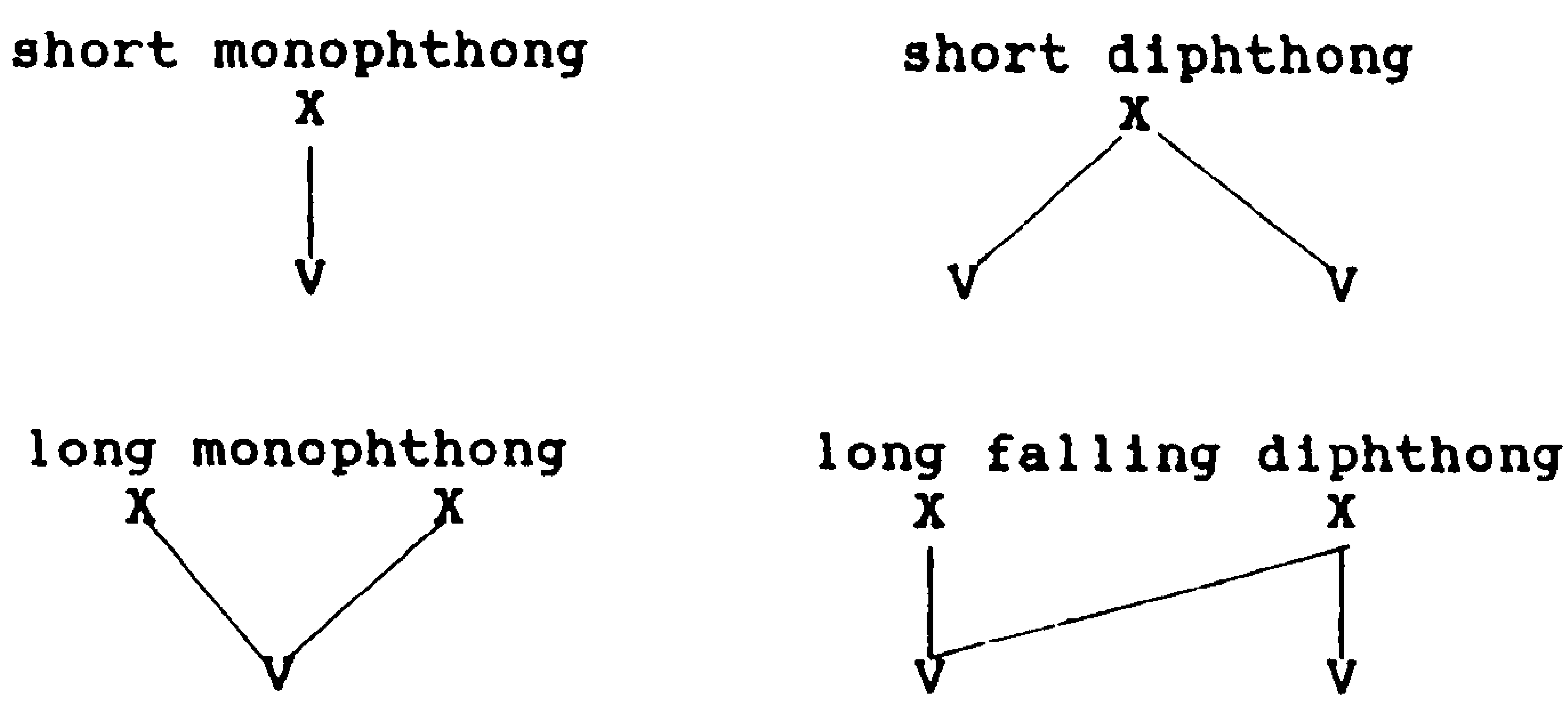
However, this hypothesis leaves us with one major problem: since the required surface vowel in *divinity* is [I], and [I] is derived from [æ] by V̌SR, how can we produce [æ] from underlying /aI/ so that it can shift to [I]?

The solution to this problem crucially depends on how we view the process of shortening or laxing of vowels.

Given a VSR restricted to derived environments, Vowel Shift will be fed by the various laxing or shortening rules, which in turn are triggered by the addition of some affix on Level 1. HM (1985) propose that laxing and shortening should be differentiated, but since, at least in RP and GenAm, the only surface vowel-types are short lax and long tense, this seems badly motivated, and it is preferable to assume that one process implies the other. That is, English has basically a set of laxing rules which automatically cause shortening, or shortening rules with concomitant laxing; I shall return to this point in Chapter 5. This point of view and an autosegmental representation may help us account for /aI/ --> [æ] --> [I].

Consider the vowel-types short monophthong, short diphthong, long monophthong and long diphthong in terms of their autosegmental attachment properties (16).

(16)

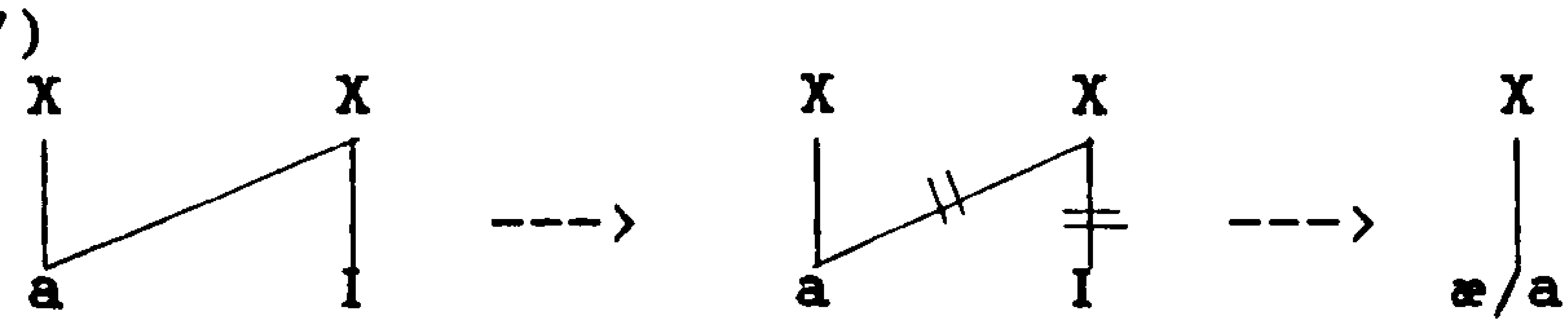


(where V is 'shorthand' for the features of a particular vowel)

Suppose that, when a vowel undergoes laxing and shortening, it loses one timing slot. Long monophthongs will then become short; in some languages they could presumably remain tense, but in RP and Genam there are no short tense vowels and shortened vowels will automatically have their value for the feature [± tense] altered. Long diphthongs will also lose a timing, or skeleton slot, and the vowel segment attached to it:

that is, they will monophthongise. If we assume that in RP and GenAm, diphthongs are long (since they pattern with long monophthongs), they should also become short lax monophthongs. Since English has only falling diphthongs, with the first element more prominent, and historical evidence suggests that falling diphthongs monophthongise by losing the second element, this is what we would expect (see (17)). The result of laxing/shortening /aI/ will therefore be the lax front unrounded monophthong which is usually represented as /æ/ (but which might equally well be assigned the symbol /a/), which will shift to [I] by V̆SR as required.

(17)



For various reasons, this kind of approach is not going to work for *profound* - *profundity*. First, /aʊ/, like /aI/, would be expected to monophthongise when laxed by losing its second element, since it is a falling diphthong; it would then become [æ] (or [a]) and shift to [I]. Even if we invented a short low back unrounded [ɑ] for this 'back' diphthong to monophthongise to (and I fail to hear any difference between the first elements of the diphthongs in *divine* and *profound* which might justify this), it would shift to [+ high, - low]. To derive [ʌ], we must stop the shift half-way, and to derive [ʊ], we need a rounding rule. Again, it seems preferable to treat this very marginal alternation as involving allomorphy rather than attempting to derive both forms from a common underlier via VSR.

3.4. Low vowels

Before proceeding to a discussion of problems facing any VSR operating on Level 1, I should return to the question of the inventories of low vowels for RP and GenAm which was inadequately resolved in the last chapter. The search for a well-motivated underlying system of low vowels will represent a recurring difficulty throughout this thesis, and will prove to be a particular problem in establishing the vowel system of Scottish Standard English (see Chapter 5). In this section, however, I shall concentrate on the low vowels of RP and GenAm, and on two main areas: the clarification of the characterisation of the *father* vowel provided by the version of Vowel Shift presented in Section 2 above, and an account of the variation between the two reference accents in words like *balm, bomb* and *bought*.

3.4.1. The *father* vowel

In SPE, the back /ā/ allegedly underlying the stressed surface vowel of *father, Chicago*, etc. was exempted from Vowel Shift by the positive [α back, α round] condition, but was subject to Diphthongisation. The appended /w/ glide then underwent a notoriously complex derivation producing eventual [āʌ], where [ʌ] could be variably realised as a centring glide or a length feature (see SPE pp.205-7). A number of arguments against this admittedly ingenious derivation were presented in Chapter 2, where it was proposed that the underlying vowel for the *father* set should be back /ɑ̄/ in English dialects like RP and GenAm, where it surfaces back, but front /ǣ/ in some Scots dialects, East Anglian and Yorkshire varieties and Australian English, in which the *father* vowel characteristically surfaces as front. However, this hypothesis necessitated a good deal of exception-marking to remove /ɑ̄/ in all cases, and /ǣ/ in *father* but not *sane* words, from the scope of the Vowel Shift Rule.

The revised formulation of VSR proposed here alleviates this difficulty. The new lax and tense-vowel VSRs will never affect underlying vowels: that is, VSR can never be the first phonological rule to apply to a vowel, since it must be fed by a tensing or laxing rule to satisfy SCC. Underlying /ǣ/ will no longer appear in any word involved in a VSR alternation: *sane* - *sanity* will have underlying /ē/, while *divine* - *divinity* show [aI] - [I] derived from /aI/. Underlying /ǣ/ or /ɑ̄/ can therefore be posited in *father, Chicago, spa* and others with no need for any special exclusion from V̄SR, since all the *father* words will constitute underived environments for both Vowel Shift Rules, so that the relevant vowel will be low underlyingly and throughout the derivation.

In both sets of accents, [ǣ] will participate in V̄SR as an intermediate stage, since /æ/ in *Caucasian,* for instance, will be tensed to [ǣ] before shifting to [ē]. However, this does not mean that /ǣ/ need 'exist' underlyingly, if we assume that a tensing or laxing rule adjusts only the value for [± tense]; /æ/, which is [- tense, + low, - high, - back, - round] will then tense to [ǣ], which is [+ tense, + low, - high, - back, - round], and is therefore guaranteed to shift in the front series of vowels, regardless of the presence or absence of /ǣ/ underlyingly. This need not constitute a violation of Structure Preservation, if we assume that lexical rules are bound to a set of underlying features, rather than segments.

I therefore assume that varieties like Scots, East Anglian and Australian English (Wells 1982) will have the low vowel system illustrated in (18), with the *father* vowel front, as it was in Middle English (Lass 1976). In RP and GenAm, on the other hand, we can assume that a context-free historical backing rule has disrupted the symmetry of the low-vowel subsystem, producing the synchronic representations in (19).

(18)

front unrounded:	tense	/ǣ/	father, spa
	lax	/æ/	cat, fatter
back rounded:	tense	/ɔ̄/	caught, bought
	lax	/ɒ/	lot, cot

(19)

lax, low, front, unrounded	/æ/	cat, fatter
tense, low, back, unrounded	/ɑ̄/	father, spa
lax, low, back, rounded	/ɒ/	lot, cot (RP)
tense, low, back, rounded	/ɔ̄/	caught, bought

3.4.2. The *balm, bomb* and *bought* vowels

Table (19) above is certainly an oversimplification, since it conceals one of the major sources of variation between RP and GenAm. The surface low vowels found in these reference accents in words like *balm, bomb* and *bought* are in fact as shown in (20).

(20)

RP

balm, calm [ɑ̄]	bomb, cot [ɒ]
bought, caught [ɔ̄]	

GenAm

balm, calm [ɑ] OR [ɑ̄]	bomb, cot [ɑ]
bought, caught [ɔ̄]	

RP has a surface tense - lax pair of low back rounded vowels in *bought, caught* versus *cot, bomb*, and a low back tense unrounded [ɑ̄] in *balm* and *calm*; the lax counterpart of this last vowel, [æ], which is found in *cat* and *fatter*, is front, low and unrounded. However, in GenAm, the *cot, bomb* set of words surface with an unrounded vowel. Wells (1982) is inexplicit on the subject of the tenseness and length of this segment, only making the rather unhelpful comment that length is not so relevant in the GenAm vowel system as it is in RP. However, Wells transcribes the *bomb* and *balm* vowels in GenAm identically, while Halle and Mohanan (1985), whose analysis of these vowels we shall examine below, suggest a tenseness distinction.

This variance may perhaps be accounted for if we assume a dialect difference within GenAm, to the effect that, for some varieties, historical /ɒ/ has simply unrounded to [ɑ], while for others, the vowel has also tensed, merging with [ɑ̄] in *balm* and *calm*; for the second group, *bomb* and *balm* will therefore be homophonous. For all GenAm, *bought* and *caught* retain low back tense rounded [ɔ̄], although Wells (1982) notes that the composition of this class is not identical for RP and GenAm, since words with historical /ɒ/ have been redistributed in GenAm between the [ɑ]/[ɑ̄] and [ɔ̄] classes. The split responsible for this discrepancy is schematised in (21).

(21) /ɒ/ RP, early GenAm

[ɑ] [ɔ̄] synchronic GenAm

bomb, cot, lot cough, dog, salt

So far, we have discussed only surface low vowels in RP and GenAm; we must now consider the appropriate underlying representations for these vowels. HM (1985) attempt to encode the variation we have observed by proposing identical underlying vowels in RP and GenAm, then applying a set of special rules in GenAm and a subset of these in RP (see (22)).

(22)

RP

	balm	bomb	bought
Underlying:	/ɑ/	/ɒ/	/o/
a/o Tensing:	ɑ̄	–	ō
Surface:	[ɑ̄]	[ɒ]	[ō]

GenAm

	balm	bomb	bought
Underlying:	/ɑ/	/ɒ/	/o/
a/o Tensing:	ɑ̄	–	ō
ɒ-Unrounding:	–	ɑ	–
o-Lowering:	–	–	ɔ̄
Surface:	[ɑ̄]	[ɑ]	[ɔ̄]

The matter of whether dialect differences should be derived by rule or be present underlyingly will be considered in Chapter 5 below; let me for the moment assume that differences between dialects may be reflected at the underlying level or generated by rule, while minor differences among speakers of a single variety like RP or GenAm must be rule-governed. HM apparently wish to generate the RP/GenAm low vowel differences entirely through the rules, but fail partially, since there must be at least an underlying distributional distinction regarding words like *cough* and *dog*, which belong with the /ɒ/ class in RP but with HM's /o/ in GenAm. There are also two more specific difficulties with HM's analysis:

- HM predict surface [ō] in *baud, bought* for RP, but the height of this vowel is exaggerated. The most common pronunciation now involves low [ɔ̄].
- HM (p.101) give *shot* (and also, presumably, *lost*, etc.) with underlying /o/. This is misleading for both accents. In GenAm, this vowel will tense and lower to [ɔ̄] under HM's analysis, although [ɑ]/[ɑ̄] surfaces, while [o] rather than the expected [ɒ] will be derived for RP.

Since I am not committed to generating all cross-dialectal differences through the rule system, and since none of the words in (20) need be excluded from my version of Vowel Shift, as none constitute derived environments for the rule, I shall reject HM's three special low vowel rules. The resulting low vowel subsystems for RP and GenAm are shown in (23).

(23)

	RP	
balm, calm, father	/ɑ̄/ = [ɑ̄]	
bomb, cot, cough	/ɒ/ = [ɒ]	
bought, caught	/ɔ̄/ = [ɔ̄]	
	GenAm	
balm, calm, father	/ɑ̄/ = [ɑ̄]	
bomb, cot	/ɑ/ = [ɑ]	or [ɑ̄]
bought, caught, cough	/ɔ̄/ = [ɔ̄]	

In most cases in (23), underlying and surface vowels are identical. Only *bomb* words in GenAm, which I have chosen to represent as underlyingly distinct from *balm* and *bought* words, contravene this generalisation. I assume that the lax low back unrounded /ɑ/ I propose in *bomb* will surface unchanged in some varieties of GenAm, while a late tensing rule will operate in others.

HM (1985) adopted the same lax rounded vowel /ɒ/ as the underlier for *bomb* in both RP and GenAm. However, I gave an unrounded underlying vowel for *bomb* words in GenAm in (23). In earlier GenAm, as in present-day RP, lax low /ɒ/ [ɒ] was appropriate both underlyingly and on the surface in words like *bomb* and *cot*. Indeed, some American English dialects, specifically those of eastern New England and southern coastal areas, preserve a rounded vowel in such forms (Wells 1982). However, these are the areas most frequently designated as non-GenAm-speaking, so that this fact does not affect the analysis of GenAm presented here. I assume that an unconditioned unrounding change has operated in GenAm, which has consequently lost /ɒ/, at least in non-alternating forms.

If a context-free sound change takes place, it seems feasible to assume that subsequent generations of speakers cease to derive the new surface vowel from the previously appropriate underlier, and instead transfer the surface form into the underlying representation. This process is schematised in (24).

(24) RP/early GenAm
bomb /ɒ/ --> [ɒ]

Innovatory stage GenAm
bomb [ɒ] > [ɑ]

Present-day GenAm
bomb /ɑ/ --> [ɑ] or [ɑ̄]

I further assume that this loss of a historically motivated but synchronically non-surfacing underlying segment will take place earliest in non-alternating forms like *bomb, cot,* where the underlier is not an input to any lexical phonological rule. That is, restructuring of underlying forms will be most likely to occur when it does not necessitate concomitant reconstruction in the rule system.

This hypothesis that underlying representations are most conservative in alternating forms can be examined for GenAm by contrasting underived *bomb, cot* with alternating *verbose - verbosity* and *harmony - harmonious.* Low back lax rounded /ɒ/ is involved in the derivation of these alternating forms in RP, as shown in (25).

(25)

	verbose	verbosity	
Underlying:	/vɜ̄bōs/	/vɜ̄bōs/	/Iti/
Affixation:	---	vɜ̄bōs]Iti	
TSL:	---	o	
VSR:	---	ɒ	
Surface:	[vɜ̄bōs]	[vɜ̄bɒsIti]	

	harmony	harmonious	
Underlying:	/hāmɒni/	/hāmɒni/	/əs/
Affixation:	---	hāmɒni]əs	
CiV Tensing:	---	ɒ̄	
VSR:	---	ō	
Surface:	[hāməni]	[hāmōniəs]	

The relevant surface vowel in *harmony* is reduced, but comparison with *harmonic* shows it to be [ɒ]. Similarly, [ɒ] surfaces in derived *verbosity*, having shifted from [o]. However, [ɒ] fails to surface in these cases in GenAm: *harmonic* and *verbosity* have [ɑ]/[ɑ̄], although *verbose* and *harmonious* share surface [ō] with RP. The question is whether we can justify omitting /ɒ/ from the GenAm vowel system in alternating forms, and if so, how the Vowel Shift Rules might operate without it.

Let us first turn to *verbose* - *verbosity*. Here, we can maintain the usual equivalence of the underlying vowel with the surface vowel of the underived form; since the input vowel in RP is /ō/, and since this surfaces in both RP and GenAm in *verbose*, I shall assume that /ō/ also underlies this alternation in GenAm. Only one derivational path through VSR is available to /ō/: suffixation of *-ity* will feed Trisyllabic Laxing, which in turn will feed V̌SR, producing [ɒ]. Thus, the underlying vowel and the derivation are identical in RP and GenAm up to this point. However, although [ɒ] is the appropriate output for RP, it never surfaces in GenAm, and so we must apply an unrounding rule (and subsequently a tensing rule for some subvarieties) to give [ɑ]/[ɑ̄]. The derivation appropriate to the early stage of GenAm at which /ɒ/ still appeared underlyingly is therefore preserved in alternating forms, although even here [ɒ] has ceased to appear phonetically.

The same is true of *harmony* - *harmonious*. Here I assume underlying /ɒ/, which will tense and shift to [ō] in *harmonious* in both RP and GenAm. /ɒ/ in underived *harmony* must subsequently be unrounded and optionally tensed; clearly the rule responsible must operate at Level 2 or the postlexical level, since it must apply both in underived environments like *harmony* and in derived forms such as *verbosity*. The derivations proposed for RP and GenAm are shown in (26). I have assumed that the underlying representations of such non-alternating forms as *bomb, cot* have undergone restructuring, but that restructuring has not occurred in alternating forms.

(26)
bomb, cot /ɑ/ --> [ɑ]/[ɑ̄]

	verbose	verbosity
Underlying:	/ō/	/ō/
TSL:	-	o
VSR:	-	ɒ
Unrounding/tensing:	-	ɑ/ɑ̄

	harmony	harmonious
Underlying:	/ɒ/	/ɒ/
CiV Tensing:	-	ɒ̄
VSR:	-	ō
Unrounding/tensing:	ɑ/ɑ̄	-

There is perhaps an alternative to this analysis for *harmony - harmonious*. One of the advantages I have claimed for my version of VSR is that the underlying vowel posited for any Vowel Shift alternation is always identical to the surface vowel of the underived member of the pair of word forms concerned, apart from the effects of late phonetic rules like the vowel reduction process observable in *harmony* as opposed to *harmonic*. The underlier chosen for [ɑ]/[ɑ̄] - [ō] in GenAm seems to contravene this generalisation. To maintain it, we must assume that the underlying vowel is /ɒ/ in RP, but has been restructured to /ɑ/ in GenAm. In fact, this is the only case of apparent cross-dialectal variation in the quality of the input vowel, and as we shall see, it is also the sole instance where alternative paths through VSR may be available, both producing the same output.

The derivational path of /ɒ/ in RP is clear from (25); it is tensed in *harmonious* and subjected to V̄SR, giving [ō]. In GenAm, the input vowel /ɑ/ would similarly tense to give intermediate [ɑ̄]. It will be recalled that this tense low back unrounded vowel is not excluded from VSR in my account; we have simply failed to find cases where it is produced by a tensing rule which would feed Vowel Shift. This would, however, be the case in *harmonious*, and the result is shown in (27).

(27)	harmony	harmonious
Underlying:	/ɑ/	/ɑ/
CiV Tensing:	–	ɑ̄
V̄SR:	–	ʌ̄

The problem now is to find a way of rounding [ʌ̄] to [ō], the required output. In fact, a suitable rule was proposed in 3.2. above, in connection with the [(j)ū] – [ʌ] alternation. Its operation in the derivation of *studious* and *harmonious* is illustrated in (28).

(28)	study	studious	harmony	harmonious
Underlying:	/ʌ/	/ʌ/	/ɑ/	/ɑ/
CiV Tensing:	–	ʌ̄	–	ɑ̄
ʌ̄-Rounding:	–	ō	–	–
V̄SR:	–	ū	–	ʌ̄
ʌ̄-Rounding:	–	–	–	ō

The flaw in this analysis is evident from (28): ʌ̄-Rounding must be assumed to apply both before and after V̄SR. This would be possible if the second application of ʌ̄-Rounding took place on a second cycle, but ʌ̄-Rounding is clearly fed by V̄SR, and only feeding changes on the same cycle are accessible to a subsequent rule on a given cycle, according to the Strict Cyclicity Condition.

The derivation of [ō] from [ʌ̄] might still be salvaged if we reformulated ʌ̄-Rounding as Non-Low Back Vowel Rounding, and reordered it after V̄SR in all derivations, as shown in (29).

(29)	study	studious	harmony	harmonious
Underlying:	/ʌ/	/ʌ/	/ɑ/	/ɑ̄/
CiV Tensing:	–	ʌ̄	–	ɑ
VSR:	–	ɨ̄	–	ʌ̄
Rounding:	–	ū	–	ō

Alternatively, we could impose only partial extrinsic ordering on rules within a stratum, so that certain rules on Level 1 would be extrinsically ordered, including Trisyllabic Laxing and CiV Tensing and the Vowel Shift Rules, while others would apply whenever their structural descriptions were met on a given cycle. The production of [$\bar{\Lambda}$] by CiV Tensing would therefore cause $\bar{\Lambda}$-Rounding to apply in the derivation of *studious* prior to the operation of $\bar{V}$SR, but since its operation would only be created by $\bar{V}$SR in the derivation of *harmonious*, it would operate later in the cycle for this form. Unfortunately, I am unable to investigate these possibilities fully at present, and will therefore continue for the moment to assume residual underlying /ɒ/ in alternating forms in GenAm.

4. Problems for Level 1 VSR

In Section 3, a number of apparent difficulties for a Vowel Shift Rule affecting lax vowels were discussed. These problems were shown to result from faults in one formulation of such a rule (McCawley 1986) rather than from the inadequacy of the concept per se. In this section, I shall consider further problems, which this time are not confined to the lax-vowel shift, but pertain to any VSR operating on Level 1 of the lexicon. The first of these concerns other phonological rules which allegedly interact with Vowel Shift, while the second involves the generation of the modern English strong verbs.

4.1. Interacting rules

One argument in favour of regarding VSR as a synchronic rule of modern English, rather than the non-productive residue of a historical change, concerns the interaction of Vowel Shift with other rules of the synchronic lexical phonology. Chomsky and Halle (SPE; 1968), Halle (1977) and Halle and Mohanan (HM; 1985) all assert that, without VSR, other modern English rules become opaque and require much more complex formulations. Since I do not intend to banish VSR altogether, but rather to form two Level 1 rules from the traditional non-cyclic tense-vowel rule, some of these arguments have no force against my analysis; for instance, HM (1985, p.103) state that VSR interacts with the lengthening and shortening rules, and this must also be true in the analysis presented here, at least for those tensing/lengthening and laxing/shortening rules ordered on Level 1. However, VSR is also said to interact with various Level 2 rules, and this is an obvious difficulty for a model restricting VSR to Level 1.

HM (1985, pp.103-4) give a list of rules which "are of a complexity and variety that would make it extremely difficult to propose an alternative treatment without Vowel Shift"; apart from the tensing and laxing rules, these are ɨ-Lengthening, ɨ-Rounding, Velar Softening and the ablaut rules Halle and Mohanan propose for strong verbs. The vowel system assumed here does not include /ɨ/, since [jū] is derived by a method quite different from that adopted by HM (see Chapter 2, Section 4.7. and Section 3 above), so that no rules of ɨ-Lengthening or Rounding will be required. I shall also argue in the next section that the strong verbs should be dealt with using allomorphy rather than derived through a set of ostensibly regular phonological rules, and will consequently dispense with HM's ablaut rules. The real difficulty is Velar Softening.

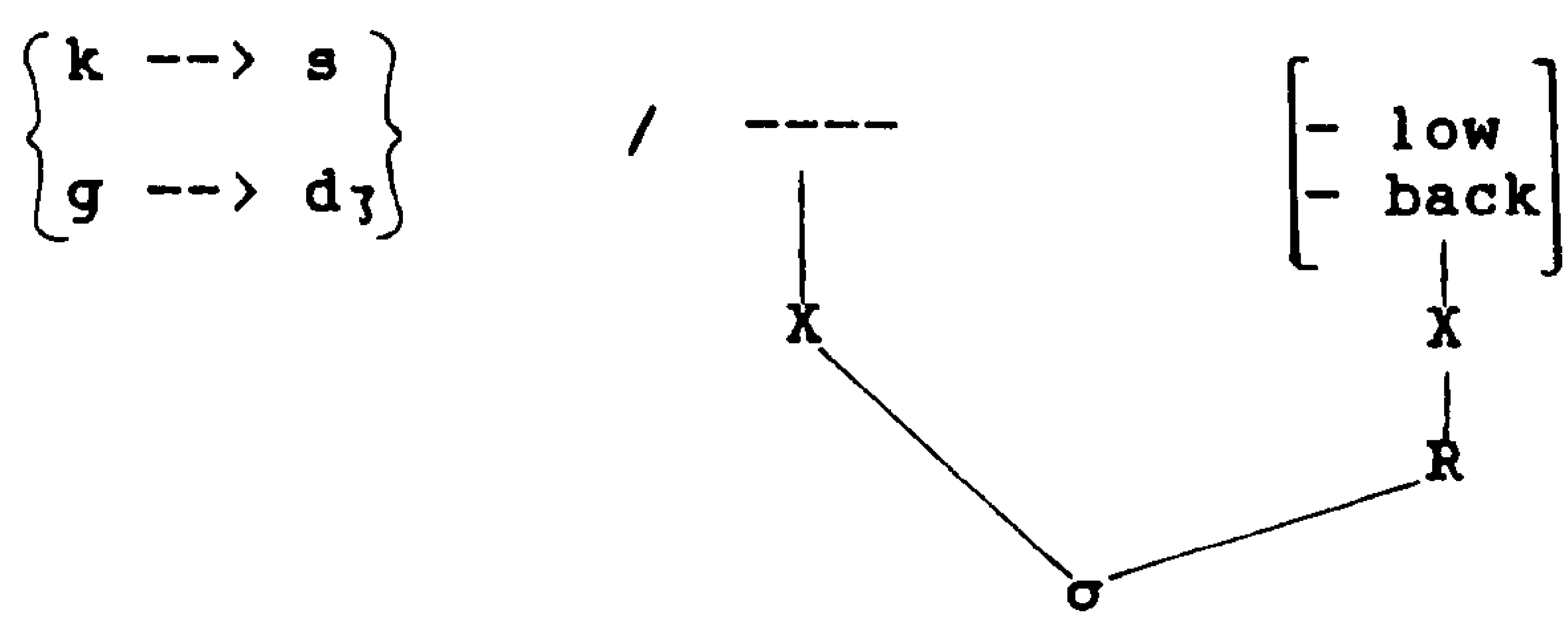
The problem of stating Velar Softening without VSR forms the core of the internal evidence for synchronic Vowel Shift in SPE, Halle (1977) and HM (1985), and is equally grave for a model retaining a VSR but ordering it on Level 1. Velar Softening changes /k g/ to [s dʒ], and must be ordered on Level 2 since it applies in underived forms like *reduce, oblige*; some further examples are given in (30).

(30)

critic - criticise	matrix - matrices
medicate - medicine	reduction - reducent
fungus - fungi	analogue - analogy

If VSR operates before Velar Softening, the context for the latter rule is hard to state, since it will consist of a following front high tense monophthong [ī], a lax mid monophthong [I] or [ɛ], and the diphthong [aI]. However, if Velar Softening applies first, to pre-VSR representations, the following context required is /ī ē I ɛ/ - that is, any nonlow, nonback vowel. The rule can then be more easily formulated; HM's version is given in (31).

(31)



(HM 1985, No.64, p.79)

The facts of Velar Softening seem irreconcilable with a Level 1 Vowel Shift. However, Jaeger (1986), reviewing the use of evidence from rule interaction in establishing the order and reality of rules, points out an important caveat for the procedure, arguing that:

"...before an internal claim of this sort can be convincing, the synchronic psychological reality and the phonetic accuracy of each rule must be substantiated."

So, before we re-order VSR on Level 2 on the grounds of its necessary interaction with Velar Softening, we should establish whether Velar Softening is itself a productive synchronic rule. This is by no means certain.

Although Velar Softening does apply in forms where /k g/ are followed by /ī ē I ε/ (surface [aI ī I ε]), as shown in (31), it does not apply to all such forms; that is, Velar Softening is not completely productive and does not operate in every case where the structural description is met. It must therefore apply to a lexically specified class of inputs, as shown by the contrasting softened and non-softened forms in (32).

(32)

Stoic - Stoicism	vs.	monarch - monarchism
lyric - lyricist	vs.	anarchy - anarchist
analog - analogise	vs.	diphthong - diphthongise

(from Rubach 1984, p.27)

In SPE, velar segments which are to undergo Velar Softening are lexically /k^d g^d/, where the superscript ^{d} corresponds to a diacritic [+ derived], to distinguish them from non-softening /k g/. Rubach (1984) supports this lexical marking approach, proposing that "a subclass of Greek and Latin words" (p.27) should be diacritically marked to indicate their eligibility for Velar Softening. It must therefore be assumed that speakers learn the specific morphemes which will undergo Velar Softening, and it is questionable whether achieving greater naturalness in the statement of the conditioning context of the rule, by ordering VSR after it, will facilitate this learning process. As McCawley (1986, p.30) says:

"Velar Softening in English is completely lexicalised and non-automatic and thus considerations of naturalness are not of any clear relevance to a choice among alternative formulations of it."

It follows that the consequences which moving VSR to Level 1 will have for Velar Softening do not constitute a strong enough argument for revoking this step and retaining VSR on Level 2.

An alternative to the above solution involves the use of underspecification. Borowsky (1986) suggests that Velar Softening might be formulated as a Level 1 blank-filling rule; as such, it will constitute a structure-building rather than a structure-changing rule, and will not be subject to SCC. Hence, Velar Softening can both precede VSR and apply to underived *reduce, oblige*. This solution is not considered in detail here, since a comprehensive account of the nature and use of underspecification theory is beyond the scope of this thesis.

4.2. The Strong Verbs

4.2.1. Introduction

The modern English strong verbs which constitute the subject of this section will be defined for present purposes as all those verbs which do not simply add a dental suffix {D} (which is realised as [-t], [-d] or [-Id] depending on the preceding phonological context) to mark the past tense, but also, or instead, change the quality of the stem vowel in some way. The set of strong verbs will then include *keep - kept, sit - sat, hold-held, fight - fought, choose - chose, lie - lay, draw - drew* and perhaps 140 others (see Bloch 1947). The term 'strong' is therefore used here to designate not only historically strong verbs, but also historically weak verbs which exhibit a synchronic vowel mutation in the past tense.

These strong verbs are of great theoretical significance, since constraints imposed on a generative theory will determine how the present and past tense forms are to be related. At least two attempts to generate the past and present tense forms of these strong verbs using common underlying representations and semi-productive phonological rules can be found in the literature: Halle 1977, and HM 1985. Both make use of supposedly revised and constrained versions of SPE generative phonology, yet both consider the strong verbs as sufficiently regular to justify derivation by rule, despite the fact that these verbs fall into very small sets of related forms, and can only be generated if a number of special rules and extremely remote underliers are adopted.

The derivation of the strong verbs is relevant to one question of considerable theoretical importance: that is, is there a principled cut-off point between regular derivation and allomorphy or suppletion? Should the primary concern of the synchronic phonologist be to cover all the available data at all costs (as is arguably the case in, for instance, SPE or HM 1985), even if this involves vastly increasing the number of phonological rules which are semi-productive at best? Furthermore, accepting forms like the synchronic strong verbs as regular, and consequently legitimately derivable by rule, begs a diachronic question of time depth. Strong verbs like *sit* - *sat* and *swim* - *swam* were certainly once part of a regular and productive pattern - in Proto-Indo-European, where the verbal category of tense was expressed in the unmarked case by ablaut. But recreating these ablaut rules in the synchronic phonology of modern English (as HM do) involves accepting as regular a set of rules which have not been productive for around 5000 years, during which time the language has evolved an entirely different tense-marking stratagem. Why should it be legitimate, and even encouraged by the simplicity metric of generative theory, to recapitulate such venerable ablaut rules here, when it is generally agreed that Lightner's (1972) synchronic Grimm's Law analysis of *heart* - *cardiac* and *father* - *paternal* is unfounded and even amusing?

I shall discuss Halle's (1977) and Halle and Mohanan's (1985) analysis of the strong verbs in Sections 4.2.2. and 4.2.3. below, and will argue that neither is satisfactory, and that the latter in particular constitutes a triumph of 'elegance' and the desire for maximal coverage of data over any plausible claim to psychological reality. I shall then argue, in Sections 4.2.4. and 4.2.5., that the majority of strong verbs should be handled using allomorphy, i.e. with both present and past tense forms stored, but linked non-derivationally by so-called morpholexical rules (Lieber 1982). However, I shall demonstrate that by maintaining the principles of Lexical Phonology set out in Chapter 1 and in Section 1 above, a clear division of derivable and non-derivable (allomorphic) strong verbs emerges. We have alternations, but should not stop at nothing to generate them all. No non-surfacing underliers or absolute neutralisations will be permitted, and there will be no gratuitous adding of new rules. If the strong verbs are meant to be derivable using VSR, we should examine this possibility using only Level 1 VSR, complete with such constraints as the Strict Cyclicity Condition, and other well-motivated rules like tensing and laxing which have already been introduced or which have independent functions elsewhere in the grammar. Imposing these stringent conditions severely restricts the set of strong verbs which can be derived by rule, and it will be shown in 4.2.5. that this set includes only those verbs which retain the most transparent connection of present and past stem vowels, and which moreover have undergone the most recent historical transfer from the regular weak to the 'irregular' strong class.

4.2.2. Halle (1977)

Halle (1977) deals with only a limited set of strong verbs, which are listed in (33).

(33)
a. lie-lay eat-ate choose-chose
drink-drank sing-sang begin-began swim-swam
b. find-found bind-bound break-broke wear-wore
dig-dug shrink-shrunk
c. write-wrote rise-rose speak-spoke freeze-froze
get-got tread-trod

Halle argues that all these verb alternations can be captured by means of two allomorphy rules, but that it is necessary to assume that all the tense stem vowels will subsequently undergo Vowel Shift. Vowel Shift, in other words, obscures the fact that two comparatively simple processes are involved in deriving the past tense forms: past tense forms in (33a.) become [+ low, - high], those in (33b.) become [+ back], and those in (c.) undergo both changes. Some representative derivations are given in (34): note that a special lowering rule of some sort will be required for *dig - dug, shrink - shrunk*, etc., since Halle's Allomorphy (b) predicts /I/ --> [ʊ], while the surface form in most dialects is [ʌ].

(34)

a.	eat-ate		choose-chose		sing-sang	
Underlying:	/ē/	/ē/	/ō/	/ō/	/I/	/I/
Allomorphy (a):	-	ǣ	-	ɔ̄	-	æ
Diphth./VSR:	īy	ǣy	ūw	ōw	-	-

b.	find-found		break-broke		dig-dug	
Underlying:	/ī/	/ī/	/ǣ/	/ǣ/	/I/	/I/
Allomorphy (b):	-	ū	-	ɔ̄	-	ʊ/ʌ
Diphth./VSR:	āy	āw	ēy	ōw	-	-

c.	write-wrote		speak-spoke		get-got	
Underlying:	/ī/	/ī/	/ē/	/ē/	/ɛ/	/ɛ/
Allomorphy (a):	-	ǣ	-	ǣ	-	æ
Allomorphy (b):	-	ɔ̄	-	ɔ̄	-	ɒ
Diphth./VSR:	āy	ɔ̄w	īy	ōw	-	-

Allomorphy (a) = V --> [+ low, - high]
Allomorphy (b) = V --> [+ back]

Halle's analysis assumes that VSR will operate in both the past and the present tense forms of those verbs in (33) which have tense stem vowels. This is clearly incompatible with the view of VSR adopted here, since we have attempted to limit Vowel Shift to cases of tense-lax vowel alternations, with the derived (i.e. tensed or laxed) vowel shifting. Before accepting Halle's treatment of the strong verbs, let us assume that the VSRs do indeed apply in derived environments only, and determine whether VSR can be fed in *eat* - *ate, find* - *found* and so on.

If VSR is to apply in the present and past tense forms of strong verbs, some change must affect both forms to provide a suitable derived environment: Halle's allomorphy rules might effect such a change. Halle considers these to be phonological rules, applying presumably to a marked class of morphemes; their limited regularity is evidence for their operation on Level 1, so that they may precede Vowel Shift. However, in (34) the allomorphy rules are shown to apply only in the past tense forms; to account for the apparent creation of a derived environment in present tenses, we might reformulate Halle's Allomorphy (a) and (b) as in (35).

(35)a.

$$\text{V} \longrightarrow \begin{Bmatrix} \text{V}_{\text{pres}} \\ \text{V [+ back]}_{\text{past}} \end{Bmatrix}$$

$$/\bar{\text{e}}\text{t}/ \longrightarrow \begin{Bmatrix} [[\bar{\text{e}}\text{t}]]_{\text{pres}} \\ [[\bar{\text{æ}}\text{t}]]_{\text{past}} \end{Bmatrix}$$

b. $V \longrightarrow \left\{\begin{array}{l} V_{pres} \\ V\ [+\ \text{low},\ -\ \text{high}]_{past} \end{array}\right\}$

$/\bar{\text{i}}\text{find}/ \longrightarrow \left\{\begin{array}{l} [[\text{f}\bar{\text{i}}\text{nd}]]_{pres} \\ [[\text{f}\bar{\text{u}}\text{nd}]]_{past} \end{array}\right\}$

(35) shows that the allomorphy rules change some feature of the stem vowel in the past tense, but also rewrite the stem, unchanged but for the addition of outer brackets, in the present tense. This corresponds to the idea of identity rules proposed in Kiparsky (1982) to derive the effects of the Strict Cyclicity Condition from the more general Elsewhere Condition.

However, this convention is clearly too powerful, since it predicts the existence of verbs whose stem vowels undergo a feature change in both the past and present tense forms. This extension of the concept of allomorphy rules is exploited by HM (1985) to allow derivations like the one in (36).

(36) $V\ [+\ F,\ +\ G] \longrightarrow \left\{\begin{array}{l} V\ [-\ F]_{pres} \\ V\ [-\ G]_{past} \end{array}\right\}$

$/\text{drIx}/ \longrightarrow \left\{\begin{array}{l} [[\text{dr}\bar{\text{ɔ}}]]_{pres} \\ [[\text{dr}\bar{\text{u}}]]_{past} \end{array}\right\}$

I shall argue below (see Section 4.2.3.) that the underlying forms proposed by HM (1985) are too abstract, and that changes of the sort shown in (36) should be disallowed. Clearly, then, allomorphy rules must be restricted to deriving the past <u>or</u> the present tense form of a strong verb, if these are seen as productive phonological rules at all.

Even if we allow added brackets to mark the rewriting of a verb stem as present or past tense, this will not feed VSR. We have already ascertained that VSR requires a purely phonological derived environment, which is generally supplied by altering the value of [± tense]. The addition of an affix, or of brackets, will consequently fail to create an appropriately derived environment for Vowel Shift.

One alternative might be to assume that the operation of the allomorphy rules will feed VSR in the past tense forms of strong verbs. However, Halle's Allomorphy (b) alters the value of the backness feature, which is not mentioned in the structural description of either VSR. Allomorphy (a) affects the height features, [± high] and [± low], which are included in the formulation of VSR (see (7) above) - although the presence of Greek-letter variables in the rule may make it rather hard to interpret which subrule the allomorphy rule feeds and when. However, this will only allow us to derive the verbs in (34a.), since those in (b.) and (c.) involve the operation of Allomorphy (b), which may not feed VSR. Even then, only the past tense forms of *eat, choose* and so on can be derived, as there is no reason for VSR to apply in the present tense.

As a last resort, we might consider altering the underlying representations of the vowels proposed for the strong verbs in (33) and (34). For instance, the underlying vowel might be made identical to the surface vowel found in the present tense, so that *eat - ate* would be underlyingly /īt/. No further derivation would be required for the present form, while Allomorphy (a) would still give intermediate [ǣt] and might feed V̄SR to produce surface [ēt]. However, this is inadequate for the verbs in (33b.) and (c.): *find - found*, for example, would have the underlying diphthong /aI/ - the effect of Allomorphy (b) on this segment is unclear, and V̄SR will also be blocked, as demonstrated above. Similarly, the underlying representation for *speak - spoke* will be /spīk/; Allomorphy (a) will derive [spǣk], which will become [spɔ̄k] after Allomorphy (b), but cannot be derived further since the last rule does not feed $\bar{V}$SR.

It seems clear that the strong verbs cannot be derived using Halle's allomorphy rules and the version of VSR developed here. Only a few strong verbs from the list discussed by Halle can be handled using this model, and these do not form a principled class distinct from the others in (33): their derivability is accidental. I shall argue below that the past and present tense forms of strong verbs like those in (33) should not be related using productive phonological rules like VSR, which will be confined to cases of tense-lax vowel alternations. Instead, two allomorphs will be stored for each strong verb, and Halle's Allomorphy rules will be reinterpreted as static morpholexical rules linking the allomorphs of classes of related strong verbs (Lieber 1982). Before elaborating on these proposals, however, I must consider a more recent analysis of the strong verbs, that of Halle and Mohanan (1985), which exploits and extends the proposals made by Halle (1977).

4.2.3. Halle and Mohanan (1985)

Halle and Mohanan (1985) are rather more ambitious in the scope of their analysis of the modern English strong verbs than Halle (1977), and claim to be able to handle all but *go, make* and *stand*, the modals, and the auxiliaries *be, have* and *do*. They invoke not only VSR and the various tensing and laxing rules, but also a special set of rules, each applicable to the stem vowels of a specially marked subset of strong verbs. There are ten of these special rules, which I shall list and discuss briefly before moving on to the details of HM's analysis.

1. Nasal Deletion (37), which operates on Level 1, deletes the velar nasal which is present in *bring* and *think*, in the past tense forms of these verbs.

(37)

$$[+\text{ nasal}] \;\text{-->}\; \phi \;/\; \text{---} \begin{bmatrix} -\text{ ant} \\ +\text{ cons} \end{bmatrix} \;]\; t\;]$$

(HM No.135, p.109)

2. x-Formation (38) is another Level 1 rule, producing /x/ from nonanterior obstruents in past tense forms (i.e. before the suffix /-t/). It operates in *sought, wrought, besought, taught, caught, brought, thought, bought* and *fought*, and its function is to create a sequence of two consonants so that Cluster Shortening (or /-CC Laxing) can apply.

(38)

$$\begin{bmatrix} -\text{ son} \\ -\text{ ant} \end{bmatrix} \;\text{--->}\; \begin{bmatrix} +\text{ cont} \\ -\text{ cor} \\ +\text{ high} \\ -\text{ voice} \end{bmatrix} \;/\; \text{---}\;]\; t\;]$$

(HM No.125, p.106)

3. Lowering Ablaut (39): this Stratum 2 rule is related to Halle's (1977) Allomorphy (a), which

makes vowels [+ low, - high] in the past tense forms of certain marked verbs. However, there are two main differences:

- Lowering Ablaut produces a nonlow vowel before voiceless continuants, especially the velar fricative /x/. This is to account for *brought, thought,* etc., which would otherwise have /I/ --> [ɒ] (by Lowering and Backing Ablaut) --> [a] (by [ɒ]-Unrounding) in GenAm. To produce [ɔ̄t], we must derive [o] by Lowering and Backing Ablaut, after which a/o Tensing and o-Lowering will give [ɔ̄t].
- HM allow their Ablaut rules to apply in the present tense forms of some verbs, notably *shake, take, say, blow* and *draw,* whereas Halle's allomorphy rules were operative only in the past tense.

(39)

$$V \longrightarrow \begin{bmatrix} -\text{ high} \\ \alpha\text{ low} \end{bmatrix} \; / \; \underline{\qquad} \; \begin{bmatrix} -\text{ ant} \\ +\text{ cont} \end{bmatrix}_{a}$$

X X

R

If a, then α = -
If ~ a, then α = +

(HM No.136, p.110)

4. <u>Backing Ablaut</u> (40):

(40)

$$\begin{bmatrix} V \\ \langle -\text{ high}\rangle_{a} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{ back} \\ \langle +\text{ round}\rangle_{b} \end{bmatrix}$$

If a, then b

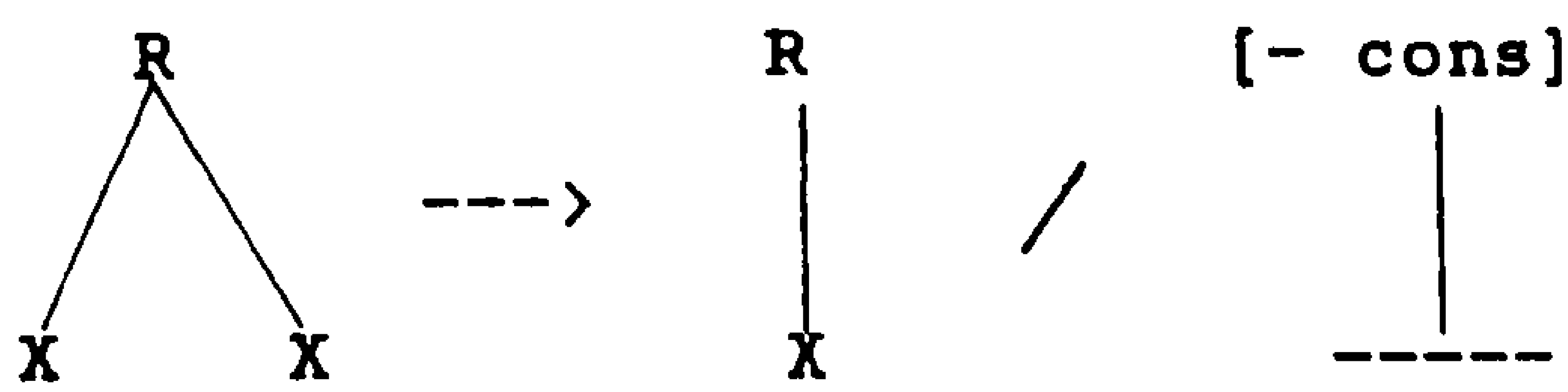
(HM No.131, p.108)

Backing Ablaut is also ordered on Level 2, and corresponds to Halle's (1977) Allomorphy (b), which backed vowels in the past tense forms of certain verbs, but again with two differences:

- it backs [+ high] vowels as in *cling* - *clung*, *swim* - *swum*, but also rounds non-high vowels as in *break* - *broke*, *get* - *got*. Halle's rule only altered backness.
- Backing Ablaut may again apply in present tense forms, as in *fall*, *hold*, *run*, *come*, *blow* and *draw*.

5. Shortening Ablaut (41). The purpose of Shortening Ablaut (Level 2) is to allow shortening or laxing in forms which do not meet the structural description of any of the regular laxing rules, like *fled*, *shod* and *saw* (although in *saw* the vowel later tenses again). Like the other Ablaut rules, it also applies to some present tense forms, including *come* and *give*.

(41)

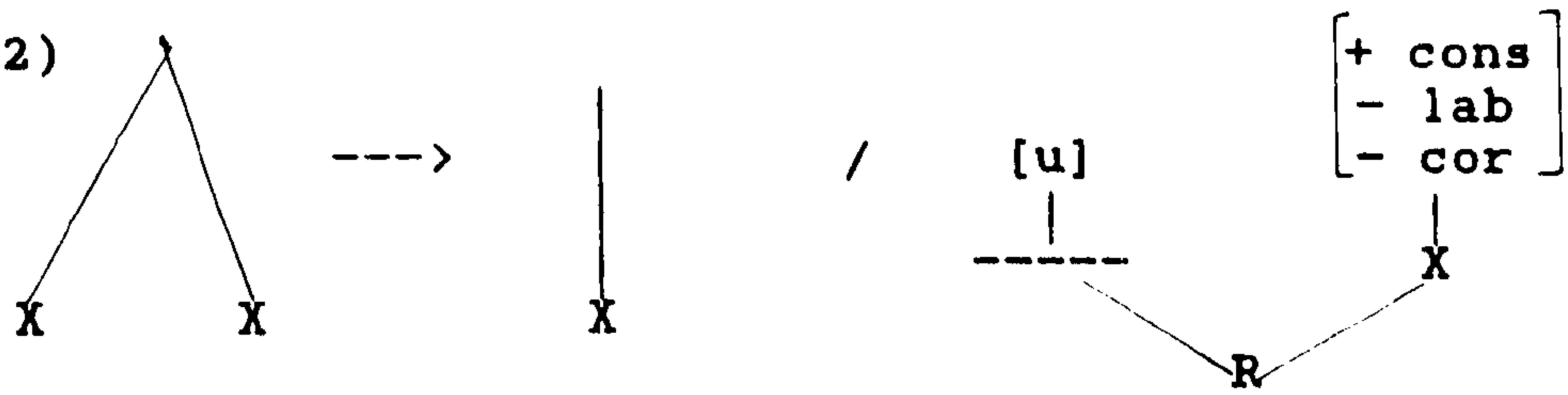


(HM No.133, p.109)

6. x-Deletion is an SPE rule adapted, though not actually formulated, in HM (1985). It is intended to stop /x/ from surfacing when it has been inserted by x-Formation, or in cases where it is assumed to be present underlyingly as in /drIx/, the underlying representation HM propose for *draw* - *drew*.

7. u-Shortening (42), which HM assume to be ordered before VSR on Level 2, shortens [ū] before velars, as in *shook*, *took*, *forsook*, with "a few idiosyncratic exceptions" (HM 1985, p.112) in GenAm like *spook* and *kook*.

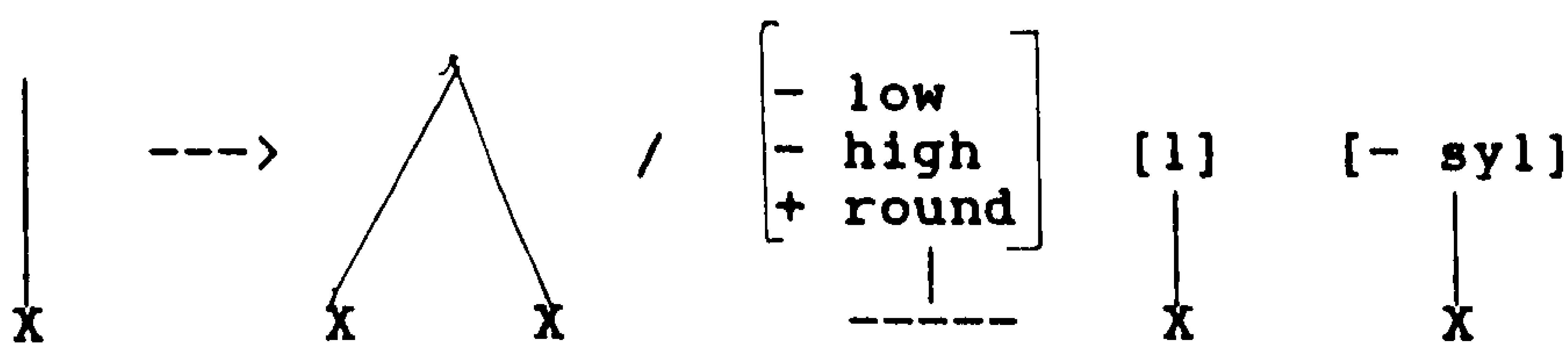
(42)



(HM No.147, p.112)

8. o-Lengthening (43):

(43)

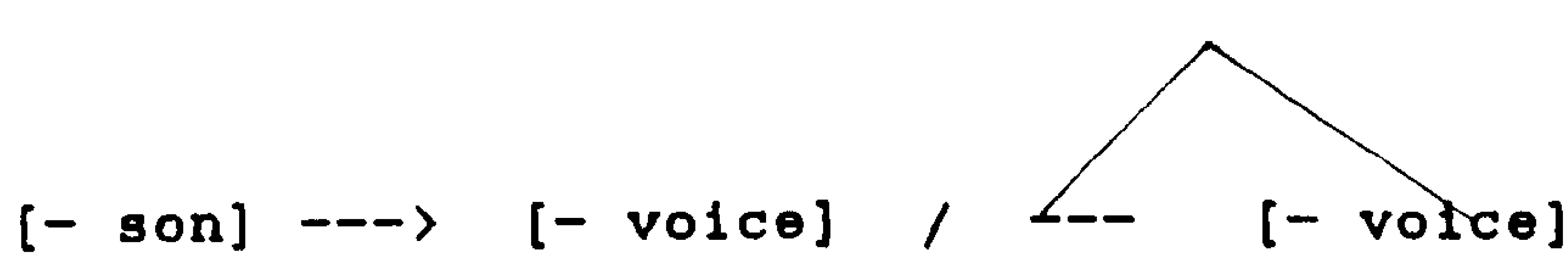


(HM No.144, p.111)

HM propose the rule of o-Lengthening for the forms *told*, *sold* and present *hold*. They note that "if this rule is ordered before o-Lowering and Diphthongisation but after Vowel Shift the correct surface vowel [ōw] will be generated" (p.112). This, however, is impossible, given that o-Lengthening is listed as postlexical but Diphthongisation operates on Level 2.

9. Voicing Assimilation (44), another postlexical rule, makes adjacent tautosyllabic obstruents agree in voicing, and is relevant to strong verbs because clusters created by Level 1 t/d-Suffixation, like *bereave+t*, *bend+t*, will undergo Voicing Assimilation to give *bereft* and *bent*.

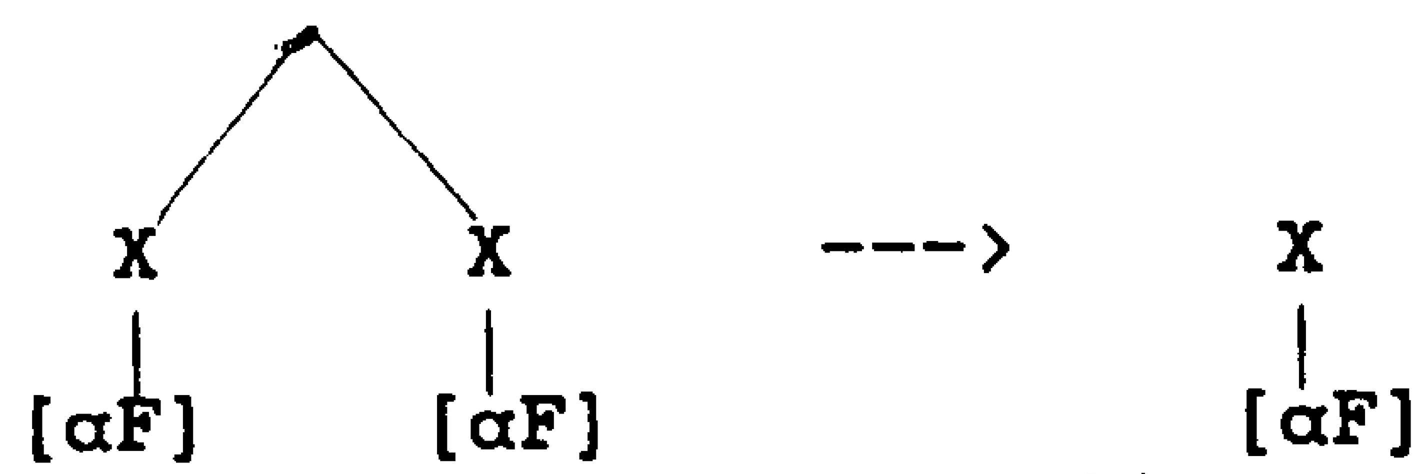
(44)



(HM No.123, p.105)

10. Degemination (45) follows Voicing Assimilation (44) and simplifies the sequences of like consonants created by t/d-Suffixation and subsequent assimilation: *bite+t* --> *bit*, *bend+t* --> *bent*.

(45)



(HM No.124, p.105)

In (46), I give sample derivations for some of the strong verbs, using the above rules. A full set of derivations, covering all the verbs mentioned by HM, can be found in Appendix 1; note that HM themselves give no derivations.

(46)

	Present		Past
		bite	
Underlying:		/bīt/	
t-Suffixation:	---		bīt]t
Cluster shortening:	---		bɪt]t
Degemination:	---		bɪt
VSR/Diphth.:	bāyt		---
Surface:	[bāyt]		[bɪt]
		eat	
Underlying:		/ēt/	
Lowering Ablaut:	---		ǣt
VSR/Diphth.:	īyt		ēyt
		hold	
Underlying:		/hɛ̄ld/	
Backing Ablaut:	hōld		---
o-Lengthening:	hōld		---
Diphthongisation:	hōwld		---
Surface:	[hōwld]		[hɛld]

		fight	
Underlying:		/fīxt/	
t-Suffixation;	---		fīxt]t
Cluster Shortening:	---		fIxt]t
Degemination:	---		fIxt
Lowering Ablaut:	---		fæxt
Backing Ablaut:	---		foxt
VSR/Diphth.:	fāyxt		----
x-Deletion:	fāyt		fot
o-Tensing:	---		fō$_{t}$t
o-Lowering:	---		fɔ̄$_{t}$t
Surface:	[fāyt]		[fɔ̄$_{t}$t]

		draw	
Underlying:		/drIx/	
Lowering Ablaut:	drεx		---
Backing Ablaut:	drox		drɨx
x-Deletion:	dro		drɨ
ɨ-Lengthening:	---		drɨ̄
ɨ-Rounding:	---		drū
Diphthongisation:	---		drūw
a/o-Tensing:	drō$_{t}$		---
o-Lowering:	drɔ̄$_{t}$		---
Surface:	[drɔ̄$_{t}$]		[drūw]

A model restricting VSR to derived environments is clearly incompatible with HM's account of the strong verbs. HM order all their Ablaut rules (that is, Backing, Lowering and Shortening Ablaut) on Level 2, and argue that VSR must apply after these; they also derive a number of present tense forms like *bereave, seek, choose, bind* and *bear*, which clearly constitute non-derived representations, via Vowel Shift. HM therefore necessarily order VSR on Level 2, where SCC is not applicable. However, these difficulties can only justify dropping our revised formulation of VSR if HM's analysis can be shown to be a defensible one. I shall argue below that this is not so.

If HM's analysis of the strong verbs is to be upheld, certain assumptions have to be accepted. First, underlying representations must be allowed to differ in a quite unconstrained way from their surface counterparts, since HM's attitude is that the rules constitute the core of the phonology, while underliers are adjusted as necessary to fit in with these:

"Although any form can be made subject to any rule, provided only that the form satisfy the input conditions of the rule, it is by no means easy to assign to a form a representation such that a set of independently motivated rules will produce the prescribed output" (HM 1985, p.106).

There are some segments which never surface, like /x/ (which may be inserted by rule or be present underlyingly, as in /bīx/ *buy*, /fīxt/ *fight*) and the back unrounded vowels /ʌ̄ ɨ̄ ɨ/; and we are faced with the usual problem of 'traditional' VSR, in that every verb with a tense stem vowel will have an underlying vowel distinct from surface.

Apart from these fundamental considerations of abstractness (which also apply to HM's work beyond the domain of the strong verbs), there are some specific problems. One concerns an ordering difficulty mentioned above: HM propose to derive [ōw] in *hold, sold* and *told* via o-Lengthening and subsequent Diphthongisation, but this is in fact impossible, given that, according to HM (p.114), o-Lengthening is postlexical, while Diphthongisation is ordered on Level 2. Secondly, 'Duke of York' derivations are prevalent, in that several verbs (see the derivation in (46) for *eat* - *ate*, and Appendix 1 for *choose* - *chose, say* - *said* and *forsake* - *forsook*) with tense stem vowels are subject to Lowering or Backing Ablaut simply to derive an appropriate input vowel for VSR, which will then produce a surface vowel identical, in many cases, to the underlying vowel (see (47)).

(47)	eat-ate		choose-chose	
Underlying:	/ē/	/ē/	/ō/	/ō/
Lowering Ablaut:	-	ǣ	-	ɔ̄
VSR/Diphth.:	īy	ēy	ūw	ōw

Finally, Ablaut rules are permitted to apply in present tense forms - Backing Ablaut in *fall, hold, run, come, blow* and *draw*, Lowering Ablaut in *forsake, slay, catch, say, blow* and *draw*, and Shortening Ablaut in *give*. This seems inconsistent with the usual assumption that ablaut is a phenomenon associated with past tense forms.

HM's analysis of the strong verbs, then, requires extremely remote, abstract underlying representations, like /bīx/ for *buy* - *bought*, /rIn/ for *run* - *ran*, /kīm/ for *come* - *came*, /kɛtʃ/ for *catch* - *caught* and /drIx/ for *draw* - *drew*. Many of these are put through a set of special rules, some of which are extremely complex (see Lowering Ablaut, (39) above), as well as VSR, and these derivations often include ablaut in the present tense, or a process of producing, destroying and reproducing the correct surface form. I contend that HM's derivations are unrealistic and untenable, and that any problems their account of the strong verbs cause for the modified Level 1 VSR can surely be discounted.

4.2.4. Strong verbs as the source of VSR

In view of the inadequacies of both Halle's (1977) and HM's (1985) attempts to characterise modern English strong verb alternations, we might seem well-advised to reject any derivation of these verbs by rule, and to treat them instead as suppletive. Vowel Shift would then be uninvolved in the generation of strong verbs. However, there is one argument against this course of action, concerning the learning of VSR by children. It is clear that children acquiring language do not learn the Latinate vocabulary which is the main repository of vowel shift alternations until comparatively late, and it has been argued that children abstract a VSR on the basis of the strong verbs, which are acquired much earlier: "the vowel shift pattern...is of course contained in quite basic vocabulary, notably in the inflectional morphology of verbs" (Kiparsky and Menn 1977, p.65). If the strong verbs are the source of VSR, it is unacceptable to account for these verbs without such a rule.

Evidence from Jaeger (1986), however, suggests that this claim is insupportable. Jaeger used as an informant her daughter Anna (age 3 years, 2 months), who did not know any of the derived, Latinate vocabulary containing vowel shift alternations, but did understand and produce a fairly large number of strong past tense forms; of 143 strong verbs listed in Bloch (1947), Anna knew 71. However,

"of the 71 verb pairs she knows, there are 27 different vowel alternation, and the patterns they fall into would if anything cause her to consider two lax vowels to be the most regular pattern. Perhaps more importantly, the same can be said for the adult pattern as a whole" (Jaeger 1986, p.85).

As shown in (48), vowel shift alternations are among the less frequently occurring patterns found in strong verbs for both children and adults.

(48)

Anna (71 verbs)

27 = 38%	two lax vowels
19 = 27%	two tense vowels
14 = 20%	Vowel Shift alternations
11 = 15%	non-VSR tense-lax pairs of vowels

Adult (143 verbs)

33% = two lax vowels
28% = Vowel Shift alternations
23% = two tense vowels
16% = non-VSR tense-lax pairs of vowels

The multiplicity of alternations involved, and the fact that, even within the VSR type of alternation, [ē] - [æ] and [ō] - [ɑ]/[ɒ], which are fairly frequent in derivationally related pairs, occur never and once respectively in the strong verbs, lead Jaeger to believe that:

"it would be unrealistic to expect that speakers will extract some particular regularities out of the pattern (specifically, VSR or H&M's lowering and backing ablaut rules) and consider others exceptions" (Jaeger 1986, p.85).

Jaeger recognises that there are potentially two reasons for qualifying this conclusion. First, overgeneralisations might be cited as evidence of rule-learning, and indeed Kiparsky and Menn (1977) note the inappropriate extension of one strong verb pattern in *bring - brang - brung*. However, Jaeger suggests that these should be seen as instances of surface analogy, in this case on the basis of *sing - sang - sung, ring - rang - rung*, one of the most common patterns. This argument for analogy is supported by the fact that:

> "the forms which have this pattern erroneously applied to them always have the same phonological shape as forms which participate in the irregular pattern" (Jaeger 1986, p.75).

Furthermore, these alleged overgeneralisations are more relevant to HM's ablaut rules than to VSR (and we have a number of other reasons for rejecting these); Jaeger notes that no overgeneralisations involving VSR alternations have been reported. Second:

> "it would be necessary to qualify the claim that alternations in strong verbs are too varied to be a possible source of knowledge about VSR if the VS alternations occurred in the words of highest frequency" (Jaeger 1986, p.85).

However, Jaeger again demonstrates that this is not the case; using figures for instances per million words of text (Carroll et al 1970) of the strong past tense forms, she establishes that those showing apparent vowel shift alternations have the lowest average frequency of all strong verbs (see (49)).

(49)

Occurrences per million words:

1878	non-VSR tense-lax
427	tense-tense
357	lax-lax
333	Vowel Shift

Jaeger's evidence suggests that the strong verbs should not be seen as the source of children's knowledge of VSR.

In view of the criticisms cited above concerning the derivation of strong verbs through supposedly productive rules of the phonology, it seems preferable to regard the strong verbs as learned, and to assume that the present and past tense forms of strong verbs are both lexically stored. I shall develop an analysis of the strong verbs based on this assumption in the next section.

4.2.5. Degrees of irregularity in the strong verbs

The conclusion to which the above discussion has led us is that all modern English strong verbs are irregular, and that all are equally irregular. That is, a synchronically strong verb by definition displays a relationship of suppletion between its present and past tense forms. I believe that this classification of strong verbs represents an undergeneralisation, since it does not take into account the existence of frequently occurring patterns of vowel alternations in, for instance, *sit* - *sat*, *sing* - *sang* and *swim* - *swam*, but would equate these, and also cases in which there is arguably an even more transparent relationship between the stem vowels, as in *keep* - *kept*, with entirely irregular and unproductive ablaut patterns limited to one or two isolated verbs, as in *fight* - *fought* or *draw* - *drew*. I shall argue that not all strong verbs should automatically be classed as suppletive, but that there exists a cline of irregularity, involving three broadly defined classes of strong verbs. I shall further demonstrate that only the version of VSR proposed here, and the principles of Lexical Phonology, predict a clear cut-off point between strong verbs derivable by rule and those whose present and past tense forms are both lexically listed.

According to the various principles expounded in 4.2.1. above, we may not derive non-alternating items from remote underliers, or make use of non-surfacing underlying segments, and we are not justified in introducing new rules to account for a very small number of forms, or in altering the representation of a word to make it undergo a rule when it would not automatically do so. It follows that we may not derive the vast majority of strong verbs using VSR, since our location of the rules on Level 1 means that one alternant with a tense vowel and one with a lax vowel is required, and *sit* - *sat* and *choose* - *chose*, which have two lax and two tense vowels respectively, would consequently have to be specially marked to allow VSR to operate. Furthermore, we must reject HM's special ablaut rules, since these are introduced solely to account for the strong verbs, and lack independent motivation.

However, there are some strong verbs which do exhibit an alternation of tense vowel in the present tense and lax vowel in the past, and which do not require the application of any special ablaut rules. I list these in (50).

(50)

hear - heard	dream - dreamt	bite - bit
creep - crept	deal - dealt	light - lit
feel - felt	keep - kept	hide - hid
kneel - knelt	mean - meant	slide - slid
leap - leapt	lean - leant	
sleep - slept	sweep - swept	
weep - wept	speed - sped	
feed - fed	lead - led	
plead - pled	bleed - bled	
breed - bred	meet - met	
read - read		

It is clear that these verbs exhibit two of the core surface Vowel Shift alternations, namely [ī] - [ɛ] and [aI] - [I]. But can these be derived using the VSR, given the formulation adopted here?

Kiparsky (1982) suggests that past tense t/d-Suffixation operates twice in the English lexicon, in accordance with the principle that the most regular morphological processes take place latest, nearest the output of the lexicon. Regular, weak verbs will receive their dental suffix on Kiparsky's Level 3; I argued in Chapter 2 that the lexicon should be limited to two levels, so that in my model regular inflections will be affixed on Level 2. However, a number of verbs, including those listed in (50), will be morphologically marked as the input to a special Level 1 word-formation rule, and these less regular verbs will have their /t/ or /d/ suffix attached here. For most of these Level 1 inflected verbs, the special *t/d* affixation rule is obligatory, so that the later, regular Level 2 rule will be blocked due to the Elsewhere Condition (Kiparsky 1982); for a small number, however, the earlier rule is made optional, so that the general rule may apply at Level 2 if the Level 1 rule is not selected, giving alternations of past tense forms like Level 1 inflected *dreamt* [drɛmt], *leapt* [lɛpt] or *knelt* [nɛlt] versus regular, weak Level 2 *dreamed* [drīmd], *leaped* [līpt] or *kneeled* [nīld].

Given this special morphological marking, no extra phonological marking is necessary to derive the past tense forms of the verbs in (50) from their present forms via VSR: the Level 1 affixation rule supplies the context for Pre-Cluster Laxing, which in turn feeds the lax-vowel VSR, as shown in (51). Verbs with /t/ or /d/ as final stem consonant, like *bite, meet* and *bleed* can be derived by V̆SR in the same way, but additionally show the operation of Degemination. All the rules involved can be shown to have independent motivation. VSR has been discussed and exemplified throughout this chapter. Pre-Cluster Laxing is a historically attested change which still applies in these 'strong' verb forms, and in other items showing the attachment of a Level 1 consonant-initial suffix, such as *width* and *descriptive*. Finally, Degemination operates on structures resulting from attachment of the Class I prefix /In/: thus, *innumerable* has initial [In-] rather than *[Inn-]. See Borowsky (1982, p.155 ff.) for a discussion of this simplification process. Borowsky argues that the production of geminates constitutes a violation of the Obligatory Contour Principle, but that the strategies adopted to avoid such violations vary depending on the lexical stratum involved: geminates derived at Level 1 will be resolved by simplification, as in the case of the irregular Level 1 past tense suffix, but those produced on a later level will be interrupted by epenthesis.

(51)	keep	bite
Underlying:	/kīp/	/baIt/
t-Suffixation:	kīp]t	baIt]t
-CC Laxing:	kIpt	bætt
V̌SR:	kɛpt	bItt
Degemination:	----	bIt

The strong verbs listed in (50) are the only ones which exhibit a surface Vowel Shift alternation, and which can be derived without either additional rules or special marking for VSR. Furthermore, the division of the verbs in (50) from all the others in Appendix 1 is not an arbitrary one. Most modern English strong verbs have exhibited their synchronic vowel alternations since Proto-Indo-European, when tense was regularly expressed by ablaut, or have arisen in only one or two verbs during the history of English (as in *sell - sold, tell - told*). However, the verbs in (50) were weak as recently as early Middle English (ME), and became 'strong' due to the innovation of two phonological processes during ME, namely Pre-Cluster Shortening and the Great Vowel Shift. The diachronic development of /hīr/ - /hɛrd/ is schematised in (52).

(52) infinitive [hērən] — past plural [hērdən]

loss of final unstressed σ

[hēr] — [hērd]

Great Vowel Shift — Cluster Laxing

[hīr] — [hɛrd]

(note that some accents subsequently become non-rhotic)

As (52) shows, early ME [hērən], with past plural [hērdən], became [hēr] and [hɛrd] after the loss of final unstressed syllables and the general shortening of vowels before two tautosyllabic consonants. Finally, the GVS affected [hēr], giving [hīr]. Modern English *hear* - *heard, keep* - *kept* and so on are synchronically shown to be 'strong' by the special morphological marking causing dental suffixation on Level 1, and the derivation involves the synchronic reflexes of the two diachronic sound changes which initially created the alternation; although, as we have seen, the present tense form is synchronically underived in phonological terms, with the underlying, lexical and surface forms identical, while the past tense form undergoes laxing and V̌SR. This does not entirely mirror the historical situation.

It is possible, then, to derive certain 'strong' verbs through the regular phonological rules even within a well-constrained model. These 'strong' verbs are morphologically marked to take a past tense inflection on Level 1 rather than Level 2, but this is their only irregular feature. This treatment of the verbs in (50) as semi-regular reflects the fact that these became strong only relatively recently, and that they were propelled from the weak to the strong class in a group, due to the advent of two phonological rules. These 'derivable' verbs also constitute the largest subclass of strong verbs, and arguably preserve the most transparent relationship between present and past tense forms.

The second group of strong verbs is composed largely of those discussed by Halle (1977), who suggested that the past and present tense forms could be related using two allomorphy rules and, for those verbs with tense stem vowels, the Vowel Shift Rule. I repeat (and slightly expand) Halle's list of strong verbs in (53), while his allomorphy rules are given in (54).

(53)
a. Allomorphy rule (a):
(i) lie-lay eat-ate choose-chose lose-lost shoot-shot
(ii) sit-sat spit-spat bid-bade drink-drank begin-began ring-rang shrink-shrank sing-sang spring-sprang stink-stank swim-swam

b. Allomorphy rule (b):
(i) find-found bind-bound grind-ground wind-wound break-broke wear-wore tear-tore swear-swore bear-bore wake-woke
(ii) dig-dug cling-clung fling-flung spin-spun sling-slung slink-slunk stick-stuck win-won wring-wrung sting-stung string-strung p.part of drink, begin, ring, sing, shrink, sink, spring, stink, swim

c. Allomorphy rules (a) and (b):
(i) write-wrote rise-rose drive-drove ride-rode shrive-shrove smite-smote strive-strove speak-spoke heave-hove cleave-clove freeze-froze steal-stole weave-wove
(ii) get-got tread-trod

(54) a. V --> [+ low, - high]
b. V --> [+ back]

The verbs in (53) tend to fall into classes, each with a fairly large membership, and each exhibiting a particular pattern of present-past vowel alternation. As we have seen, the relationship between the surface vowels is never transparent enough to allow the past and present forms to be derived from a common underlier without undue abstractness or additional rules; however, simply listing these forms without acknowledging that recurring patterns exist also seems unsatisfactory. I aim to compromise by invoking allomorphic linking.

The question now is what we mean by allomorphy. One interpretation of allomorphy was discussed in 4.2.2. above; Halle (1977) adopted the usual generative phonological procedure of proposing a single underlying representation for each verb and using special allomorphy rules (as well as productive phonological processes) to derive the past tense forms. However, we have seen that the status of such allomorphy rules is unclear, and that Halle's analysis is additionally incompatible with the view of VSR presented here, Instead, I shall adopt Lieber's (1982) notion of allomorphy, which involves stored stem variants and linking morpholexical rules.

Aronoff (1976), like Halle, proposed a set of special allomorphy rules, which, like other phonological processes, were taken to be generative. Lieber's position, however, is that "allomorphy is accomplished before any productive processes of word formation operate, and that allomorphy is not a generative process at all" (1982, p.29). Instead, Lieber intends to list all allomorphs of each morpheme in the lexicon, along with any information peculiar to each allomorph; for instance, /profʌnd-/ is bound, while /swæm/ only occurs in the past tense. 'Semi-regular' forms with a common pattern will form an allomorphy class, and members of each class will be linked by morpholexical rules, which have the status of redundancy rules - an example is given in (55).

(55)

Morpholexical rule (i): $C_0IN - C_0æN$
OR $C_0VN - C_0V[-\text{ high}, +\text{ low}]N$

Morpholexical rule (ii): $C_0IN - C_0ʌN$
OR $C_0VN - C_0V[+\text{ back}]N$

Allomorphy class (a), morpholexical rule (i):
members: sing-sang, swim-swam, ring-rang...

Allomorphy class (b), morpholexical rules (ii):
members: fling-flung, dig-dig, sting-stung...

An advantage of this system of stored allomorphs and linking morpholexical rules is that, presumably, not all speakers need have any rule. Some speakers might learn individual verbs without abstracting any generalisations about specific verb classes, while others might recognise similarities between verb pairs and innovate a linking rule.

Lieber's main motivation for listing stem variants in this manner is the fact that either allomorph may be selected as the input to later morphological processes taking place in the lexicon. To take one example, some English nouns with final voiceless continuants in the singular form have plurals with voiced continuants - so *hou*[s] but *hou*[z]*es* and *shel*[f] but *shel*[v]*es*. Lieber cites this as a case of allomorphy since not all nouns with final /f s θ/ undergo voicing in the plural, e.g. *kisses* and *cliffs*. Consequently, forms with voicing in the plural are assumed to have two stored allomorphs, one with a final voiceless fricative, the other with a final voiced sound: and indeed, the voiced allomorph serves as the input to a further process of word-formation, namely zero-derivation of nouns to verbs. Thus, the verbs *house, mouthe* and *shelve* are derived without phonological change from stored allomorphs with final voiced fricatives. In a model with readjustment or allomorphy rules, which are generally taken to apply after Word Formation Rules, this would not be so easy to state, since the final voiced sounds would be created only after the morphological component.

The morpholexical rules adopted for strong verbs with lax vowels in both tenses will effectively mirror Halle's allomorphy rules, given in (54) above. In early Middle English, exactly the same rules would have reflected the alternations of strong verbs with consistently tense vowels, so earlier /ē t/ would have become past tense [ǣt], with a [+ low, - high] vowel, while present /fīnd/ alternated with past tense [fūnd] with a back vowel, as predicted by Halle's rules (and by the more general versions of the morpholexical rules in (55) above). However, in late ME the introduction of the Great Vowel Shift obscured the parallel of such verbs with other strong verbs with lax vowels. I have argued that, in the absence of tense-lax alternations, we cannot ascribe knowledge of VSR to modern English speakers: that is, we cannot expect speakers to 'uncover' the effects of Halle's allomorphy rules by abstracting away the operation of the Great Vowel Shift. Consequently, the morpholexical rules proposed for strong verbs with lax vowels in (55) above will be limited to just these verbs, while classes of verbs with tense vowels will be linked by less general rules (see (56)).

(56)

find - found   bind- bound

C_0aIC_0 - C_0avC_0

write - wrote   drive - drove

C_0aIC_0 - $C_0\bar{o}C_0$

The final class of strong verbs to be discussed here contains the most highly irregular verbs, which are either isolated single examples or occur in very small groups. Whereas the first class above, including *keep* - *kept*, involved derivation by rule, and the second, including *sit* - *sat* and *drive* - *drove*, have stored allomorphs but occur in sufficiently large groups or with a sufficiently transparent connection between present and past tense forms to justify linking the allomorphs with a morpholexical rule, the third class generally includes single verbs which can be considered suppletive. Even Halle and Mohanan (1985) required the full canon of their special rules to derive some of these alternants, while they were unable to relate *make* and *made*, *stand* and *stood*, *go* and *went*, the past and present forms of the modals, and the various forms of the auxiliaries *be*, *have* and *do*. In this third class I include at least those verbs listed in (57), assuming that their past and present tense forms are simply stated in the lexicon, as in (58), with neither derivation nor static class linking.

(57)

seek-sought teach-taught
sell-sold tell-told
see-saw
bring-brought think-thought
buy-bought fight-fought
fly-flew
strike-struck
fall-fell
run-ran
hold-held
forsake-forsook take-took shake-shook
come-came
give-gave
slay-slew
catch-caught
say-said
blow-blew know-knew grow-grew throw-threw
draw-drew
make-made
stand-stood
go-went
can-could shall-should
may-might
will-would
am/is/are-was/were
has/have-had
do-did

(58) $[\text{fɒl}]_{pres} = [\text{fɛl}]_{past}$
$[\text{kʌm}]_{pres} = [\text{k\={e}m}]_{past}$

I should note that the division between classes 2 and 3 is not entirely clear-cut; the criteria used have been the size of the synchronic strong verb subclass and the 'phonetic distance' between the surface past and present forms. It may be that all the strong verbs in these classes should be listed with morpholexical rules (Lieber 1982), and that some of these rules simply link more pairs of vowels than others. However, this rather messy boundary between two classes of strong verbs, all of which are irregular, but some of which are more irregular than others, highlights the more principled and orderly division between verbs like *keep* - *kept* and *bite* - *bit*, which were weak until relatively recently and became 'strong' due to the operation of two sound changes whose synchronic reflexes are still involved in their derivation, and all the other strong verbs, which are of diverse origins and varying degrees of opacity, and which form only small subclasses. This well-motivated division is a direct result of the adoption of the bipartite tense and lax Vowel Shift Rule proposed above, and the anti-abstractness principles which can be imposed on a Lexical Phonology.

The reanalysis of the synchronic Vowel Shift Rule proposed in this Chapter indicates three clear ways in which a constrained Lexical Phonology differs from SGP; these are relevant to the aims and objectives of lexicalist theory outlined in Chapter 1.

1. The strict imposition of 'anti-abstractness' constraints inevitably prohibits a maximally simple phonology; thus, VSR becomes two rules instead of one, and j-Insertion has marked lexical exceptions. It seems that the idea of the evaluation metric will have to change for more concrete phonological models. The optimal phonology will no longer be the one with the most simple and elegant analyses, but the one which most

closely adheres to the principles and constraints imposed on it, and which furthermore is consistent with both internal and external evidence.

2. Synchronic phonological rules and the diachronic sound changes which are their source need not be identical, as was assumed in SGP, or indeed bear much resemblance to one another. This point has been exemplified by the Great Vowel Shift and its synchronic reflexes, the Vowel Shift Rules, which are formulated differently and have distinct inputs; for instance, the [aʊ] - [ʌ] alternation was historically a product of the GVS, but is not included in the synchronic Vowel Shift 'concept', while [jū] - [ʌ] is not historically a Vowel Shift alternation, but is now derivable via the VSR. Furthermore, although sound changes and synchronic phonological rules are not connected by the maximally close relationship of identity, concrete lexicalist analyses reveal more enlightening connections between synchrony and diachrony. For instance, the account of the [jū] - [ʌ]/[ʊ] alternation developed in Chapters 2 and 3 paralleled a historical dialect split in an interesting way, while the treatment of the modern English strong verbs revealed a principled division between those verbs like *keep* - *kept* which were most recently transferred from the weak to the strong class, from other verbs which have maintained their ablaut alternations for longer and which are arguably no longer synchronically derivable from a common underlying form.

3. Different dialects may have different underlying forms for the same lexical items, and different underlying inventories of segments. Illustrations of such differences between RP and GenAm were given above from the low vowels.

The first two of these conclusions have already been reasonably well exemplified, although I shall return to both in the Chapters below; the relationship of synchrony and diachrony will, indeed, be the focus of Chapter 6. However, the third is rather more tentative, and I propose to pursue it at greater length in Chapters 4 and 5. Since sufficient evidence is not available from RP and GenAm alone, I shall introduce a third reference accent, namely Scottish Standard English.

Chapter 4

Scots and Scottish Standard English: A Synchronic and Diachronic Outline.

1. Introduction

In the last two chapters, I have attempted to demonstrate that a rigorous application of the constraints made available in Lexical Phonology (LP) enables a significant reduction in phonological abstractness. I proposed underlying inventories and sets of rules for two reference accents, RP and GenAm; these analyses proved to be substantially less abstract than those found in other generative treatments of modern English, such as SPE or Halle and Mohanan (1985). Furthermore, support for the proposed rules and underlying representations was drawn not only from internal synchronic evidence such as the analysis of extant alternations, but also from the discussion of dialect variation, historical developments, and the results of psycholinguistic tests.

At the end of Chapter 3 I drew three tentative conclusions, which I restate briefly here.

1) The strict imposition of the principles of LP will reduce abstractness, but will inevitably also make the phonology less simple: for instance, the SPE Vowel Shift Rule becomes two rules in my analysis, and j-Insertion is analysed as having lexical exceptions. It seems that our evaluation metric must be changed; we must alter our focus from a concentration on maximal simplicity and elegance, to a calculation of how well the proposed phonology meets the constraints imposed by our theory.

2) The discussion of VSR indicates that a synchronic phonological rule and the sound change which is its source need not be identical, or even bear much resemblance to one another.

3) It may be necessary to assign different underlying representations and segment inventories to different dialects. Thus, the *father* vowel is front in some accents of English, and back in others. This approach contrasts clearly with the treatment of dialect differences in Standard Generative Phonology, where the requirement for maximal simplicity and economy arguably retarded the percolation of change into the synchronic grammar. In the SPE model, it is clear that related dialects will tend to share the same underlying inventories and representations, while differing in their phonological rules. As Chomsky and Halle contend (1968, p.49):

> "...underlying representations are fairly resistant to historical change, which tends, by and large, to involve late phonetic rules. If this is true, then the same system of representation for underlying forms will be found over long stretches of space and time."

This preference for additions to the rule system over alterations in the underlying representations leads to an essentially static situation in which the continuum from dialect to language variation is obscured: if dialects diverge and become distinct languages over time, but related dialects are not permitted to differ at the underlying level, what are the conditions which sanction the sudden leap from same representations / different rules, to different representations?

These observations begin to answer the three points with which we began in Chapter 1 - the questions of abstractness in the synchronic phonology, the relationship between synchrony and diachrony, and the treatment of dialect differences. However, none of these areas has yet been fully explored, and nor does the material considered in Chapters 2 and 3 fully justify the conclusions drawn above. We have at least partially resolved one of our synchronic problems, that of abstractness. But we have not assessed the extent of possible dialect differences at the underlying level, nor have we discovered what might give rise to such underlying discrepancies. Very little attention has been paid to the relationship of sound changes to phonological rules, apart from a partially substantiated assertion that they need not be identical. Finally, and perhaps most importantly, we have suggested replacing the standard generative simplicity metric with an evaluation measure based on adherence to the constraints and principles of LP: but although we have investigated the synchronic power of these constraints, in that they combat abstractness, we have not explored their diachronic implications.

One of these remaining difficulties, the matter of the treatment of dialect differences, is largely synchronic. The other two are partially historical, or involve the interaction of synchrony and diachrony. I make no apology for this inclusion of a diachronic viewpoint in a generative work. On the contrary, I believe that we cannot fully understand a system solely by observing it as it is, but only by also investigating how it has come to be. A phonological theory should therefore be judged on its analysis of synchronic data, its accordance with diachronic evidence, and the extent to which it enlightens us on the relationship between these two aspects of language.

The accents on which we have concentrated so far, RP and GenAm, have proved to be extremely closely related. In fact, their underlying inventories and phonological rules are well-nigh identical, with the exception of certain aspects of the low vowel subsystem. It is clear that these varieties have simply not diverged far enough, or for long enough, to provide us with conclusive evidence on the nature, extent and cause of underlying dialect divergence, or even to truly test our hypothesis that such underlying divergence exists. It is my contention that the introduction of a third reference accent, this time from Scotland, will equip us with sufficient data to resolve these remaining problems. Scots is less well-known than RP or GenAm, and has seldom been comprehensively described, certainly not in any recent formal phonological model, but I hope to show that it differs from the other accents described here in interesting and theoretically significant ways.

In this chapter, I shall introduce our third reference accent and trace its diachronic divergence from Southern British English, including the innovation of a sound change, the Scottish Vowel Length Rule, which is of particular interest with respect to both the relationship of synchrony and diachrony, and the evolution of dialect distinctions. In Chapter 5, I give a synchronic account of the Scottish Vowel Length Rule, and discuss further the treatment of underlying dialect differences in LP. In Chapter 6, I consider the connection of lexical and postlexical rules with two distinct types of sound change, and argue that LP, as well as being a convincing model for synchronic phonology, can also be seen as integrating change and synchrony in a way that Standard Generative Phonology could not.

2. Scots and Scottish Standard English

The term Scots is in fact highly ambiguous. In an attempt at clarification, I shall reserve it in what follows to refer to non-standard Scottish dialects of English, which must be distinguished from Scottish Standard English (SSE), the local equivalent of RP or GenAm.

2.1 Scottish Standard English

The Scottish Standard English (SSE) accent will be the focus of Chapters 5 and 6, and we shall return to it in Section 4 below, outlining its phonology and comparing it with RP. For the moment, however, a sociolinguistic definition will suffice. In Scotland, as in other areas of the English-speaking world, the Standard English dialect is the usual medium of communication in formal situations and among middle-class speakers. Standard English tends to be spoken with some standard accent, which is defined socially rather than regionally; as Wells (1982, p.34) says:

> "A standard accent is the one which, at a given time and place, is generally considered correct: it is held up as a model of how one ought to speak, it is encouraged in the classroom, it is widely regarded as the most desirable accent for a person in a high-status profession to have."

In England, the standard accent is RP (albeit with some minor regional variation), and across most of the United States, excluding New England and the South, it is GenAm. In Scotland, there is an equivalent standard, SSE, which is clearly distinct from RP, although it enjoys the same status as a prestige accent within Scotland.

As Giegerich (forthcoming, p.39) admits, "the SSE accent is in a sense an analyst's artefact"; just as there are varieties within RP and GenAm, so SSE has slightly different characteristics in different areas of Scotland. The variety which I shall describe later in this chapter as SSE is typical of middle-class Edinburgh and Glasgow speech - outlying areas like Aberdeen and the Border country share many but not all of its features.

As an accent of Standard English rather than a distinct dialect, SSE differs from RP only in its phonology, although there may also be a few local lexical items borrowed from the speaker's native Scots dialect.

2.2 Scots

While SSE, as we shall see in Section 3 below, has only been in existence since the 18th Century, the pedigree of the Scots dialects is much longer, and Scots has been diverging from other varieties of English since the Old English period. The resultant continuum of non-standard dialects is widely spoken in rural areas and by the urban working classes of Edinburgh, Glasgow, Aberdeen and Dundee. Scots dialects are distinctive in syntax, morphology, vocabulary and phonology, and some examples will be given in Section 4, but it may be enlightening to first consider briefly the external history of Scots, and the circumstances which have led to the synchronic division of Scots from SSE.

3. External History

We know very little of the linguistic situation in early Scotland. There are traces of Pictish; Jackson (1955) has argued that there were probably two Pictish languages, one Indo-European and the other of uncertain ancestry, although this conclusion is disputed. Subsequently, a branch of Brythonic or _p_-Celtic was replaced by Gaelic, a Goidelic or _q_-Celtic language, following the invasion of the Scotti from Ireland in the 5th Century AD. Gaelic spread rapidly across Scotland north of the Forth.

South of the Forth, the Anglo-Saxon conquest of Lothian in the 7th Century introduced a Germanic competitor language in the form of the Old Northumbrian dialect of Old English: Scots is descended from Old Northumbrian, rather than from the Mercian, West Saxon and Kentish dialects which are the source of modern English in England. Synchronic differences between Scots and other varieties of English are therefore at least partially due to a dialect division in Old English, and _not_ to the influence of Gaelic. This common misconception merits comment immediately; there is in fact remarkably little

Gaelic influence on Scots, and indeed Gaelic has been progressively driven north and west by Scots since the early introduction of Old Northumbrian to the Lothians.

Lothian was ceded to the Scots in 973, but retained its Germanic language rather than adopting the majority language, Gaelic. Embryonic Scots was influenced successively by Norse, the language of the Viking invaders, and by Norman French, for although the Normans did not conquer Scotland, many were granted land by the Scottish Crown. Scots gradually gained in prestige, aided in this by the rise of the burghs which were founded by David I and his successors and settled largely by Scots speakers, and which rapidly became influential commercial centres. Divergence from English continued between the 11th and 15th Centuries, although during this period Scots is generally referred to as *Inglis*, with *Scotis* referring to Gaelic. By the 14th Century, French influence had begun to recede, and Gaelic was being gradually forced north into the hills in response to pressure from expansionist Scots. Inglis appeared in literature with Barbour's *Brus* in 1375, and became the official language of the Scottish Parliament, in place of Latin, in 1424. By 1500, Scots was securely established as the official language of the court, judiciary and government, and it is at this point that *Scottis* is first used to describe "the King of Scotland's Scots as opposed to the King of England's English" (Murison 1979, p.8).

Middle Scots, under the Stewarts, enjoyed a notional Golden Age from around 1450 to 1560, as the official language of a reasonably successful independent kingdom, with a vibrant literary tradition exemplified by Henryson, Dunbar and Gavin Douglas. However, the linguistic balance in Scotland began to shift after the onset of the Reformation in 1560. Knox and his followers succeeded in establishing Presbyterianism, but in the absence of a Scots translation of the Bible, they used the Geneva English edition: "from then on, God spoke

English" (Kay 1988, p.59). This distribution of the English Bible paved the way for the introduction of much more written English; English printers set up shop in Scotland, and English gradually became the standard literary language.

Scots truly began to decline after the Union of the Crowns in 1603, when James VI of Scotland became James I of England. The Scottish court moved to London and adopted English, and the acquisition of spoken and written English became the key to successful self-aggrandisement. Finally, after the Union of Parliaments in 1707, English became the language of law, education and administration.

After the Jacobite uprising of 1745, Gaelic was also suppressed, but this did not benefit Scots. Gaelic had already by this period retreated behind the Highland Line, an imaginary frontier running roughly from Inverness to Oban. Scots was never spoken beyond the Highland Line: instead, English was widely taught here, so that speakers switched from Gaelic to English, uninfluenced by Scots. Inhabitants of the Gaelic and post-Gaelic areas today speak a variety called Highland English, which retains from Gaelic a distinctive intonation pattern, and some non-standard syntax, like the prevalent *It's Donald you'd be seeing / It's to Skye you'll be going* construction. In pronunciation, Highland English clearly is English rather than Scots, giving rise to the common but initially mystifying assertion that the "best" English is nowadays spoken in Inverness.

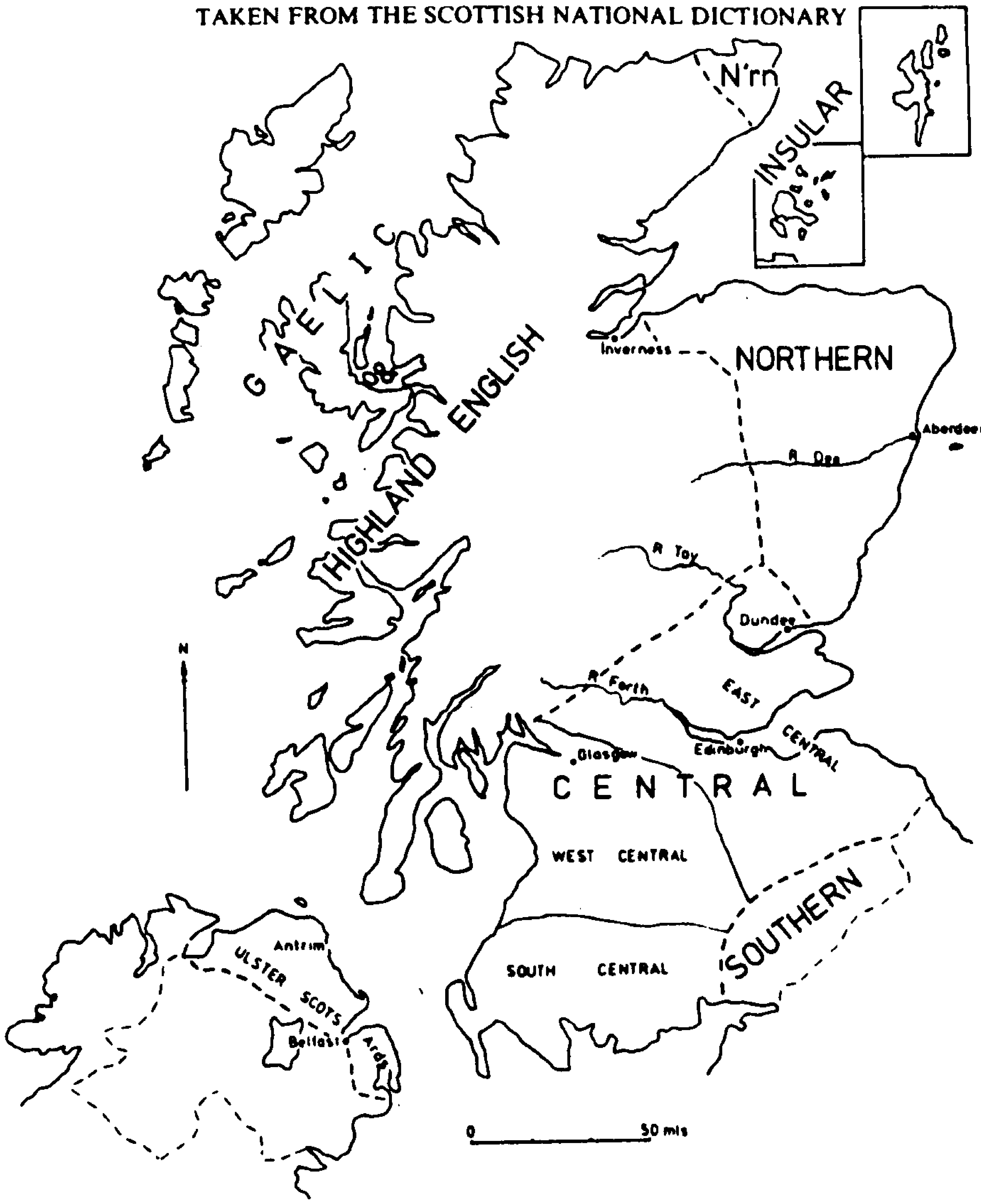
Scots continued to lose ground in the Lowlands, while failing to gain a foothold in the Highlands. In the 18th Century, it dropped out of use almost entirely as a written language; there have been various revivals in poetry since, reflected in the verse of Robert Burns or the "synthetic Scots" of Hugh Macdiarmid, but very little prose has appeared. Upwardly mobile middle-class Scots sought to replace their Scots with English, and assiduously read books which promised to weed out unwelcome Scotticisms. However, these obviously concentrated on features of vocabulary, syntax and morphology, which could be set down easily in writing, while largely ignoring phonetics and phonology, and the resulting amalgamation of Standard English grammar and lexicon with a Scots accent, our modern SSE, came to be acceptable both within and outwith Scotland. As even Boswell admitted (see Kay 1988, p.84), "a small intermixture of provincial peculiarities may, perhaps, have an agreeable effect."

Although SSE gradually ousted Scots in formal circumstances and for middle-class speakers, Scots dialects (although discouraged in the education system) have continued to be used by working-class speakers in the cities, and in rural areas - and much of Scotland is rural. I shall now briefly consider the nature of this Scots dialect continuum, and some of the distinctive characteristics of Scots dialects and SSE.

4. The Scots dialects and SSE: Synchronic Linguistic Characteristics

(1)

THE DIALECTS OF SCOTS
DRAWN BY CAILEAN MACLEAN
TAKEN FROM THE SCOTTISH NATIONAL DICTIONARY



From Kay (1988)

The map in (1) above shows the area in which modern Scots, as opposed to Gaelic or Highland English, is spoken. The Scots-speaking region is shown as divided into four dialects, labelled as Central, Southern, Northern and Insular: these dialect divisions have been in existence since the 15th Century, although the availability of a standard literary Scots at that time means that dialect differences are only rarely reflected in contemporary writing. A discussion and classification of the differences among these dialects is beyond the scope of this work, and I shall concentrate on describing features which are common Scots rather than specific to one dialect, although some characteristics of particular areas will be mentioned in the discussion below. Kay (1988, Ch.10) gives a more comprehensive account of Scots dialect variation.

Scots speakers are likely to exhibit non-standard features in all areas of the grammar. In syntax, many Scots dialects have multiple negation, and there are also regional idiosyncracies like the role reversal of *bring* and *take* in Aberdeenshire, as seen in *I'm in the garden; could you take me out a drink?* In morphology, auxiliary plus negative sequences are contracted to give forms like *cannae, couldnae, dinnae, didnae*: these contractions have a limited distribution, however, and are replaced by *can ye no, do ye no,* etc., in tag questions. Scots is also peppered with non-standard lexical items, such as *fankle* for 'tangle', *skelf* for 'splinter', *glaur* for 'wet mud', *wabbit* for 'tired' and, in different parts of Scotland, *beagie. neap* or *tumshie* for 'turnip'.

The focus of this thesis, however, is phonology; and it is the sound system of Scots and its development that form the topic for the remainder of this chapter. Although the non-standard lexical, morphological and syntactic characteristics given above are found only in Scots dialects and not in SSE, the phonological features to be discussed below tend to be shared by the SSE accent. I shall consider the consonant system first, before moving on to the more interesting material provided by the vowels.

4.1 The Consonant System

The majority of the segmental developments in the historical phonology of English have involved the vowels rather than the consonants, and the same is true of the synchronic phonological rules. Furthermore, differences between accents of English tend to involve vowels rather than consonants. There are, however, some minor differences between Scots and SSE on one hand, and RP or GenAm on the other.

First, Scots and SSE are conservative in that they retain the voiceless velar fricative /x/, which other English dialects have lost since the Middle English period. The distribution of this segment is limited, and it tends to occur in distinctively Scots lexical items like *loch*, *dreich*; place and personal names such as *Auchtermuchty*, *Tulloch*, *Strachan*; and sometimes in words originally borrowed from Greek or Hebrew which have <ch>, like *epoch* [ipɔx] or *parochial* [paroxiəl]. In Insular Scots, it also commonly occurs in an initial cluster with /w/ in place of other Scots and SSE /kw/ - so *question* is [xwɛstʃən] and *queer* is [xwi:r].

Scots dialects and SSE also have the voiceless labio-velar fricative /ʍ/ (sometimes symbolised /hw/), which contrasts with /w/ in minimal pairs like *Wales* /w/ versus *whales* /ʍ/, or *witch* /w/ versus *which* /ʍ/; the members of these pairs are homophonous for many speakers of RP and GenAm. /ʍ/ is found in words like *what*, *where*, *when* and in most other cases of <wh> spellings, although as Wells (1982, p.409) observes, <w> spellings sometimes correspond to [ʍ] pronunciations, as in south-east Scots *weasel* [ʍi:zl̩], or <wh> to [w], as in *whelk* [wʌlk]. In Northern Scots, /ʍ/ has become a voiceless labial or labio-dental fricative, [ɸ] or [f], in all contexts, producing such characteristic Aberdeenshire pronunciations as [fe:r] 'where' and [fa:] 'who'.

A final difference concerns the distribution of /r/. Both RP and Scots/SSE have this phoneme, but in Scots and SSE its functional load is far greater since these accents are rhotic, whereas in non-rhotic RP [ɹ] surfaces only pre-vocalically and is deleted before a consonant or a pause. As for realisation, very few Scots now consistently use trilled [r], although this is found occasionally in the north. The most common allophonic variants are the alveolar tap [ɾ] and the post-alveolar approximant [ɹ], and Wells (1982, p.411) suggests that the tap often appears in the environments V--V and C--V, and the approximant V--C and V--#, with either initially.

4.2 The Vowel System

In (2) below, I reproduce the underlying vowel systems for RP and GenAm which have emerged from the emendations to Halle and Mohanan (1985) proposed in Chapters 2 and 3. These may be compared with the SSE/Scots system listed in (3).

(2)

(a) RP

ɪ	ʊ	ī	ū				
ɛ	ʌ	ē	ō		aɪ	aʊ	ɔɪ
æ	ɒ		ɑ̄	ɔ̄			

(b) GenAm

ɪ	ʊ	ī	ū				
ɛ	ʌ	ē	ō		aɪ	aʊ	ɔɪ
æ	ɑ (ɒ)		ɑ̄	ɔ̈			

(3) SSE/Scots

ɪ			i		u			
ɛ	(ɛ̈)	ʌ	e	(ø)	o	ai	au	ɔi
			a		ɔ			

I should note initially that the system in (3) is a core, skeleton or overall system, which is not appropriate in all its details to either SSE or to any particular Scots dialect. For instance, the vowels /ë/ and /ø/ are bracketed in (3) since they rarely appear in SSE but are fairly widespread in the dialects. Similarly, more anglicised speakers of SSE will adopt certain oppositions from RP, as we shall see below. However, this core system is a useful abstraction, since a wide range of Scots dialects and varieties of SSE can be easily characterised by minor additions or deletions; for a classification of Scots dialects using a similar system, see Catford (1958).

In Chapter 5, the phonology of SSE will be more thoroughly examined from a synchronic point of view, and certain modifications to the system in (3), notably concerning the low vowels, will be suggested on the basis of internal phonological evidence. For the moment, however, I shall simply indicate some illustrative differences in surface contrast, distribution and realisation between SSE and RP.

4.2.1. Specifically Scottish Vowels

I shall begin by discussing two vowels, /ø/ and /ë/, which are very frequently encountered in Scots and occasionally in SSE, but which are not characteristic of our other reference accents of English. /ø/, a mid front rounded vowel, appears dialect-specifically in words like *foot*, *floor*, *moon* and *spoon*; I shall consider its origin in 5.2.3. and its distribution in 5.2.8.1. below. /ë/ presents a far more intriguing prospect, and merits consideration now.

Abercrombie (1979) notes that the first person to classify /ë/ as a vowel distinct from both /I/ and /ɛ/ was A.J. Aitken, in whose honour it is sometimes called "Aitken's vowel". It is easy to see why /ë/ evaded notice for so long, and why so many writers on Scots (including Lass 1974; Agutter ms., 1988a, b) either say nothing about the vowel, or are content to list words in which /ë/ characteristically appears; for various aspects of the quality, origin and distribution (both areal and lexical) of /ɛ̈/ are opaque. Abercrombie (1979) and Wells (1982) do, however, provide some useful information on /ɛ̈/, and this constitutes the basis for what follows.

/ɛ̈/ characteristically occurs in words like *bury, devil, earth, clever, jerk, eleven, heaven, next, shepherd, twenty, ever, every, never, seven, whether*; however, Winston (1970), who tested a number of subjects from Edinburgh University for the presence and use of /ɛ̈/, found that although all her informants had contrastive /ɛ̈/, there was not one word where they all consistently used it. In addition, /ɛ̈/ has a regionally-defined distribution, occurring principally in dialects of the West, the Borders, Perthshire and at least some parts of Edinburgh. Even within these dialect areas, some speakers will use /ɛ̈/ in a large number of words while others will have it in only one or two.

As for the quality of /ɛ̈/, some agreement can be found as to what the vowel is not like, but precise descriptions of its realisation are scarce. Wells (1982) at least attempts a diagnostic account of how to recognise /ɛ̈/:

> "Where present, /ɛ̈/ is phonologically and phonetically distinct both from /I/ and from /ɛ/, and in quality is typically somewhat less open than cardinal 3 and considerably centralised. The opposition can be tested by the triplet *river* vs. *never* vs. *sever*. If *never* rhymes neither with *river* (/I/) nor with *sever* (/ɛ/), then it can be assumed to have /ɛ̈/."

Even less information can be gleaned on the origin of /ɛ̈/. Wells (1982, p.404) does, however, quote one reasonably plausible explanation from Kohler (1964). Kohler notes that, in some Scots dialects, /ɛ̈/ is used in most or all of the words where SSE and RP have /ɪ/. He suggests that /ɛ̈/ was the original short vowel rather than /I/ in these areas, but that /I/ was later borrowed from English dialects and used in the same set of words. /ɛ̈/ tends to survive most consistently and widely in a small and dialectally variable number of forms like *never, shepherd, seven,* etc., in which English dialects had /ɛ/ but Scots has /ɛ̈/ or native /I/ - spellings like <niver> are relevant here.

4.2.2. Diphthongs

The systems in (2)a. and (3) above both include the tense mid vowels /e/ and /o/. However, although the choice of identical symbols for these vowels in RP and Scots/SSE reflects identity of phonological function, it conceals a general realisational difference. While these mid vowels surface consistently as the diphthongs [eI] and [oʊ] in RP, they are realised as steady-state monophthongs, [e] and [o], in SSE and Scots, so *date* and *boat* are [det] and [bot] rather than [deIt] and [boʊt].

Diphthongisation in Scots dialects (with the exception of Southern Scots, see Kay (1988, p.158)) and in SSE is generally rare, the only surface diphthongs being realisations of the 'true' diphthongs /ai/, /au/ and /ɔi/. I have argued that these three should also be analysed as underlyingly diphthongal, and this goes for Scots/SSE as well as RP and GenAm. Again, however, there is a realisational difference: in Scots and SSE, these diphthongs are generally pronounced [ʌi], [ʌu], [ɔi]: all the second elements tend to be slightly more prominent than in RP, while the first element of the /ai/, /au/ diphthongs is more central than the [a] of RP [aI], [aʊ̈]. The underlying representations /ai/, /au/ and /ɔi/, rather than /ʌi/, /ʌu/ and /ɔi/ have been selected for Scots/SSE due to considerations concerning the synchronic operation of the VSRs, and the Scottish Vowel Length Rule, which will be discussed below and in Chapter 5.

4.2.3. Pairwise Contrasts Absent in Scots/SSE

(4)

Scots/SSE	RP	
/a/	/ɑ̄/	psalm
	/æ/	Sam
/ɔ/	/ɔ̄/	caught
	/ɒ/	cot
/u/	/ū/	pool
	/ʊ/	pull

As (4) indicates, there are three pairwise contrasts in RP which are absent in SSE and Scots, being reduced to a single segment. There are consequently a number of minimal pairs in RP which become homophonous for Scottish speakers. Abercrombie (1979, p.75-6) points out that more anglicised speakers of SSE may import these oppositions from RP, and claims that these loans tend to follow a particular pattern: the introduction of the /u/-/ʊ/ opposition presupposes /ɔ/-/ɒ/, which in turn presupposes /ɑ/-/æ/. The low vowel contrasts are quite common in SSE, especially in Edinburgh, but the /u/-/ʊ/ distinction is very rare and tends to be inconsistently maintained.

4.2.4. Vowels Before /r/

Whereas most accents of English have lost vowel distinctions before /r/, or introduced new centring diphthongs, Scots and SSE maintain an earlier situation, as shown in (5).

(5)

	RP		SSE/Scots
		bird	Ir
	ɜ	word	ʌr
		heard	ɛr
	Iə	beer	ir
	ɛə	bear	er
	ɑ	car	ar
	ʊə	poor	ur
ɔ̄	ɔ̄	sport	or
		short	ɔr

Scots and SSE therefore lack the vowel mergers and other accommodations in the vowel system which the loss of non-prevocalic /r/ has created in RP. The question of /r/ in general, including its linking and intrusive guises, is worthy of extended investigation, but the outline above is sufficient for our purposes.

4.2.5. The Scottish Vowel Length Rule

The systems in (2) and (3) are, however, distinguished by more than the segmental differences presented above. In fact, Scots and SSE (and the related Ulster Scots - see Harris 1985) are unique among varieties of English in terms of the organisation of the vowel system. In RP, GenAm, Australian English and other accents, there are two sets of underlying monophthongs, one long and tense (this conjunction of properties being indicated in (2) by a macron) and the other short and lax. In Scots/SSE, however, vowel length has been neutralised. The historical and synchronic formulations of the process responsible for rendering vowel length predictable, the Scottish Vowel Length Rule (SVLR) or Aitken's Law (Aitken 1981), along with its consequences, will be the subject of much discussion in the next three chapters; meanwhile, a preliminary version of the rule is given in (6).

(6) SVLR: preliminary version

$$\begin{array}{c} X \\ | \\ V \\ [?] \end{array} \;\; \text{--->} \;\; \begin{array}{c} X \quad X \\ \diagdown \diagup \\ V \end{array} \;\; / \;\; \text{---} \;\; \left\{ \begin{array}{c} r \\ v\ \ z\ \ \text{ʒ}\ \ \eth \\ ] \\ V \end{array} \right\}$$

SVLR, then, lengthens a certain set of vowels (to be defined later) when they precede /r/, any voiced fricative, a vowel, or a bracket - the Lexical Phonological equivalent, as noted in Chapters 1 and 2 above, of a word or morpheme boundary. /i/, for instance, will consequently be long in *beer, breathe, key, keyed* and *Fiat*, but short in *keep, wreath, keen* and *need*. For the majority of vowels affected, SVLR simply controls an alternation of length, but for the diphthong /aI/, there is a concomitant change of quality from [ʌi] in short contexts to [a:i] in long environments.

The short survey above reveals profound differences between the vowel system of Scots and SSE and those of other varieties of English, and I shall return to a more thorough characterisation of these synchronic disparities in Chapter 5. However, I intend to preface this synchronic description with a historical account of the development of the Scots and southern British English vowel systems, from early Middle English onwards. Just as an outline of the external history of Scots served to explain the synchronic division of Scots from SSE, and of both from other varieties of English, so an examination of the internal history of Scots and English will indicate the sources of the differences in their synchronic vowel systems, as well as demonstrating that the system I propose for SSE is historically motivated.

Although I intend, for reasons of sociolinguistic equivalence, to compare SSE rather than Scots with RP and GenAm in subsequent chapters, the internal history charted here must inevitably be that of Scots. There are two reasons for this concentration on Scots dialects here: first, we have seen that SSE is a relatively recent phenomenon, dating only from the 18th Century; our investigations will take us back to the 13th Century, when Scots existed but SSE did not. Secondly, as we have already seen, SSE shares many of the distinctive phonological features of Scots. In fact, SSE owes the aspects of its phonology which distinguish it from RP to its Scots dialect sources: 18th Century middle-class Scots speakers adopted Standard English vocabulary, morphology and syntax, but retained the phonology of their native Scots dialect.

5. Internal History

We have already seen that RP is the descendant of the Mercian and West Saxon dialects of Old English, while Scots has Old Northumbrian as its ancestor. These southern and northern dialects of Old English developed into Southern and Northern Middle English (ME). In the early ME of approximately 1250 AD, the Northern and Southern vowel inventories were remarkably similar; I therefore propose a common early ME system as a starting point. Between the 13th and the 17th Century, a number of sound changes affected this common system. Some applied equally in the North and the South; others, however, affected the systems of the two areas differently, or were restricted to one area, and I examine the differential operation of these sound changes in Section 5.2.

5.1. The Common Early Middle English Vowel System

The common Early ME vowel system in (7) is appropriate to the period after Homorganic or Pre-Cluster Lengthening, which probably operated around 900-950 AD, and before Long Low Vowel Raising, the first of the series of sound changes which produced disparities between the Northern and Southern systems. The effects of this and subsequent changes on the inventory and distribution of the vowels in (7), and on the set of features required to describe them, will be detailed in section 5.2 below.

(7)

i		u	i:	u:	iu		ui	
e		o	e:	o:				
				ɔ:	ɛi	ɛu	ɔi	ɔu
	a		æ:	ɑ:	ai		au	

The vowels in (7) generally have native Old English (OE) sources, and may also occur in loans from Old French (OF) and Old Norse (ON). The sources are listed in (8) (mainly after Aitken 1976 ms.).

(8)
Sources of the Vowels

Long monophthongs

/i:/
- OE, ON /i:/
- OE, ON /y:/
- OE /i y/ by Homorganic Lengthening (note that /i/ did not lengthen before /-nd/ in the North - RP /faInd/, Scots /fInd/)

/e:/
- OE, ON /e:/
- OE /e:/ by i-Mutation of /o: æ:ɑ e:o/
- OE /e:o/, monophthongised
- OE /æ:/, especially æ[1] < W.Gmc. */a:/, as in dæd 'deed', slæpan 'sleep'
- OF /e:/ - so Older Scots cleir, gre
- OE /e/ by Homorganic Lengthening

/æ:/
- OE /æ:/, primarily æ[2] < i-Mutation of W.Gmc. */ai/, as in clæne 'clean'
- OE /æ:ɑ/, monophthongised
- ON /a:/
- OE /æ/ by Homorganic Lengthening

/ɑ:/
- OE/ɑ:/
- OF /a:/ in ME grace, age, cave
- OE /ɑ/ by Homorganic Lengthening

/ɔ:/	- OF /ɔ:/, as in ME *rose*, *noble*, *robe* (for evidence that the quality of this vowel in Anglo-Norman was /ɔ:/, see Bliss 1969)
/o:/	- OE, ON, OF, Middle Dutch /o:/ - OE /o/ by Homorganic Lengthening
/u:/	- OE /u:/ - ON, OF /u:/ - OE /u/ by Homorganic Lengthening (note that /u/ did not lengthen before /-nd/ in the North)
Short monophthongs	
/i/	- OE, ON, OF /i/ - OE /y/
/e/	- OE, ON, OF /e/ - OE /eo/
/a/	- OE /æ ɑ æɑ/ - ON, OF /a/
/o/	- OE, ON, OF /o/
/u/	- OE, ON, OF /u/
Diphthongs	
/ai/	- OE /æ(:)j/ - OF /ai ei/ - ON /ej ei/
/ɔi/	- OF /ɔi/
/ui/	- OF /oi ui/
/ei/	- OF /ei/ - eME <eȝe> /e:jə/, as in <eȝe> 'eye', <deȝe> 'die'
/au/	- OE /ɑ:ɣ/, /ɑ:w/ - ON /ɑ:ɣ/ - OF /au/
/ɔu/	- OE /o:w/ - OE, ON /o:ɣ/ - ON /au/
/ei/, /iu/	- OE /æ: ɑw æ:w e:ow i:ow ɑ:w/ - OF /ieu/, and also /y:/ in the South, but only /y:+/ in the North - Anglo-Norman /eu/

5.2 The Sound Changes

I shall now outline the operation and effects of several sound changes, up to and including the Great Vowel Shift (GVS) and the Scottish Vowel Length Rule (SVLR), which created disparities between Northern and Southern dialects of ME. The survey is relatively superficial, and only Middle English Open Syllable Lengthening, GVS and SVLR are dealt with in any depth. A much more detailed account of the relevant developments in Scots can be found in Johnston (1980), on which this section is partly based. Given the status of this section as a general survey, no particular theory or explanation of phonological change is argued for or assumed. I shall return to the diachronic aspect of Lexical Phonology, and notably to the question of the relationship of sound changes and phonological rules, in Chapter 6.

5.2.1. Long Low Vowel Raising (late 12th Century)

As shown in (7) above, early ME had two long low vowels, front /æ:/ and back /ɑ:/. Long Low Vowel Raising (9) affects both of these.

(9)

/æ:/ > /ɛ:/ in the North and South, in *read*, *clean*, sea (later > /i:/ by GVS).

/ɑ:/ > /ɔ:/ in the South only

/ɑ:/ > /æ:/ in the North only

$$\text{South: } \begin{bmatrix} \text{V} \\ -\ \text{high} \\ -\ \text{mid} \end{bmatrix} \quad > \quad [+\ \text{mid}]$$

$$\text{X} \qquad\qquad \text{X}$$

North:

$$\begin{array}{c} \begin{bmatrix} \text{V} \\ -\text{high} \\ -\text{mid} \\ -\text{back} \end{bmatrix} \\ \text{X} \qquad \text{X} \end{array} \quad > \quad [+\text{mid}]$$

$$\begin{array}{c} \begin{bmatrix} \text{V} \\ -\text{high} \\ -\text{mid} \end{bmatrix} \\ \text{X} \qquad \text{X} \end{array} \quad > \quad [+\text{front}]$$

North of the Humber, /ɑ:/ was not raised, but we must assume that it fronted, since it later participates in the GVS as part of the front vowel series, raising to /e:/. This discrepant development of /ɑ:/ has resulted in various synchronic North-South differences of vowel distribution, as shown in (10): note that SSE, in a clear case of anglicisation, shares the RP pronunciation, albeit without diphthongisation.

(10)

RP:	stone, home	/oʊ/
SSE:	stone, home	/o/
Scots:	stane, hame	/e/

Long Low Vowel Raising left Southern ME with NO long low vowels, and Northern dialects with only front /æ:/.

A following /w/ coalesced with the output of Long Low Vowel Raising of /ɑ:/ to give Southern /ɔu/ (> RP /oʊ/) and Scots /au/ (> /ɔ/): again, SSE 'agrees' synchronically with RP (see (11)).

(11)

RP:	blow, snow	/oʊ/
SSE:	blow, snow	/o/
Scots:	blaw, snaw	/ɔ/

5.2.2. Middle English Open Syllable Lengthening (early 13th Century)

Middle English Open Syllable Lengthening (MEOSL) remains a controversial process, and one discussed in detail by Dobson (1962), Lieber (1979) and Minkova (1982, ms.). That such a change took place in the period between OE and ME is not a matter of contention, and nor is the very general outline formulation of the process as a lengthening of all the short vowels /i e a o u/ (see (8) above for sources) in the North, and [- high] short vowels in the South, in both cases in open syllables. However, various aspects of MEOSL are still disputed, and Minkova (1982, p.29) singles out three of the more problematic areas:

> "1. The problem of the qualitative difference between the original short vowels and their lengthened reflexes.
> 2. The behaviour of the high vowels /i/ and /u/ with respect to the change.
> 3. The existence of a large number of exceptions to MEOSL."

Minkova herself deals with the third problem. She notes that, given the 'traditional' environment of $/---C_0^2VC_0\#$ (which allows for medial /sp st sk/) for MEOSL, a large number of exceptions to the lengthening become apparent. Authors of ME handbooks, like Jordan (1925) and Luick (1921), and also, more recently, Dobson (1962), have attempted to account for these exceptions by simply noting that, for instance, many contain a liquid or nasal in the second syllable, or by grouping together items like *bodig, popig, penig, hefig* and postulating either secondary stress on *-ig* or long final /i:/. Sadly, these attempts at principled explanation are either non-explanatory (as in the first example above) or lack evidence (as in the second). Minkova therefore adopts a different approach.

Minkova (1982) includes a complete list of words which are known to have been present in English at the time of

MEOSL, meet the structural description of the process, and have survived to Present-Day English. She includes only items with original non-high vowels, since /i u/ lengthened inconsistently, and considers both native and Anglo-Norman material. Minkova splits the items on her word-list into two sets, one containing items which are still disyllabic in Modern English and the other composed of items which are now monosyllabic due to final schwa-loss, and calculates the percentage of the words in each set which have undergone MEOSL. She finds that only 16% of the synchronically disyllabic words exhibit lengthening, while MEOSL has operated without exception in words which have also undergone schwa-loss, and consequently proposes a restatement of the environment for MEOSL (12).

(12) $/ ---- C_1^1e\#$, where e = /ə/

This reformulation of the MEOSL environment indicates a definite link between MEOSL and schwa-loss, but does not determine their relative chronology. It is generally assumed in the ME handbooks that MEOSL (except as it affected the high vowels) preceded schwa-loss, but in fact Minkova demonstrates that no absolute evidence can be found for either order of these two changes: "simultaneity is the only positive assumption we can make about their chronology" (Minkova 1982, p.46).

Minkova further suggests a foot-based, rhythmic account of the dynamic relationship between the two changes (1982, ms.), proposing that:

1. When a light stressed syllable and a following light syllable consisting only of schwa constitute a foot, and the unstable word-final schwa is lost, the stressed syllable will tend to acquire an extra mora to preserve isochrony of feet, and the vowel in this syllable will lengthen; this is MEOSL.

2. Once schwa has been lost, the new lengthened vowel can merge with a pre-existing long vowel or form a new vowel phoneme, since the lengthening context will then have been lost.

This hypothesis fits in with the fact that both MEOSL and schwa-loss apparently began in the North, both taking place in the South around a century later. Jespersen (1922) suggested that schwa-loss operated initially in the North due to Norse influence, which was strongest in this area, and a concomitant loss of inflection; this tendency towards inflectional decay then spread south. No case of this sort has been made for MEOSL, and it seems unlikely that Norse influence could directly explain the commencement of open-syllable lengthening in the North. However, the intimate connection of MEOSL and schwa-loss assumed by Minkova predicts that MEOSL should have started in the North, since schwa-loss, a prerequisite for the lengthening, is first evidenced in this area.

In what follows, I shall assume that Minkova's formulation of the MEOSL environment is correct. I now turn to a consideration of the effects of the rule, and thus to the first of the problems with MEOSL pointed out by Minkova (1982, p.29) - "...the qualitative difference between the original short vowels and their lengthened reflexes".

MEOSL seems to have proceeded in two waves, both beginning in the North. The first was probably initiated in the 12th Century and spread south by the 13th Century; the second, involving the high vowels, began in the 13th Century and was confined to Northern areas (13).

(13)

1st wave

OE mëte /e/	ME	mēte	/e:/	'meat'
OE þrōte /o/	ME	þrōte	/o:/	'throat'
OE hāra /a/	ME	hāre	/a:/	'hare'

2nd wave (North only)

OE wicu /i/	ME wēkes (pl.) /e:/ 'week'
OE sunu /u/	ME sōnes (pl.) /o:/ 'son'

Note that the lengthening of /a/ in the first wave creates a new long low vowel phoneme in the South, which had been left without long low vowels after Long Low Vowel Raising.

Two main sources of evidence, involving spelling and rhymes, indicate that MEOSL produced a qualitative as well as a quantitative change.

1. Spelling Evidence: In 12th and 13th Century manuscripts, uninflected and inflected forms of words showing graphic alternations are found (see (14)).

(14)

wik (nom. sg.)	wēkes (pl.) 'week'
sun " "	sōnes " 'son'
iveles (gen. sg.)	ēvel (nom. sg.) 'evil'
sumeres (pl.)	sōmer (nom. sg.) 'summer'

These spellings do not suggest a simple lengthening process; the fact that ‹i› alternates with ‹e› and ‹u› with ‹o› seems to indicate that the OE short vowels have both lengthened and lowered. Such evidence is available only for the high vowels, since the long high-mid vowels /e: o:/ and the long low-mid vowels /ɛ: ɔ:/ were not orthographically distinguished in ME, /e: ɛ:/ being written ‹e(e)› and /o: ɔ:/, ‹o(o)›. Thus, even if OE /e/, /o/ did lower as well as lengthening by MEOSL, the spelling provides no evidence. /a/, which was already low, seems only to have lengthened to /a:/.

2. Rhyme Evidence: If MEOSL involved only a quantity change, one would expect the lengthened reflexes of OE /i u e o/ to rhyme with ME /i: u: e: o:/ respectively.

However, these expected rhymes are not supported by the evidence; instead, we find the rhymes shown in (15).

(15)

(<OE styrian /i/)	stēre	-	wēre	ME /e:/ (<OE /e:/)	Brus
(<OE guma /u/)	gōme	-	dōme	ME /o:/ (<OE /o:/)	Cursor Mundi
(<OE /e/)	bēren	-	lēren	ME /ɛ:/ (<OE /ɛ:/)	Lieber 1979
(<OE /o/)	brōken	-	strōken	ME /ɔ:/ (<OE /ɔ:/)	Lieber 1979

Such rhymes again indicate that MEOSL involved a quality change; short high vowels in open syllables merged with long high-mid vowels, short high-mid vowels in the MEOSL environment merged with long low-mid vowels, and only /a/ merely lengthened.

Some additional evidence for this proposed quality change comes from the Great Vowel Shift. If our usual assumptions about this sound change are correct, the relevant non-low vowels must have lowered before shifting. *Week*, for instance, surfaces in Modern English with [i:]; this is consistent with its having had an /e:/ vowel in ME, but not /i:/, which would have produced modern /aI/. Similarly, *bear*, with Modern English [e:], must have had /ɛ:/ at the time of operation of GVS; if OE /e/ had simply lengthened to /e:/ in ME, one would expect ModE *[bi:r] or *[bIə] 'bear'.

The analysis presented above, then, leads to the interpretation of the effects of MEOSL schematised in (16), whereby non-low short vowels before ---C_1^1# both lengthen and lower by one degree of height.

(16)

OE		ME		OE		ME
i		i:		u		u:
e		e:		o		o:
		ɛ:				ɔ:
a	⟶	a:				

⟶ = MEOSL

The major problem with this interpretation of MEOSL is that it is unclear why the process should cause vowel lowering. The very name of this sound change suggests a basic modification of quantity, and there seems to be nothing inherent in such a lengthening process that should lead to concomitant lowering; Pre-Cluster or Homorganic Lengthening, a 10th Century vowel lengthening change, had no effect on quality.

An additional hypothesis might be that some process affected the set of short vowels, from which both Pre-Cluster Lengthening and MEOSL took their inputs, between the 10th and 12th Centuries. The obvious assumption would be that non-low short vowels lowered during this period; Dobson (1962) actually proposes that /i u/ had become high-mid and /e o/ low-mid before MEOSL, and quotes arguments by Trnka and Vachek to the effect that the resultant isolation of /i: u:/, which were left with no short congeners, caused them to move out of the monophthongal system altogether by diphthongising during the Great Vowel Shift. However, no such lowering process has been proposed elsewhere, and there is no direct evidence or motivation to support it. An alternative, and better founded, explanation might be that the feature [± tense] became relevant in the English vowel system at this time, so that short vowels came to be interpreted as lax (17).

(17)
OE - long versus short vowels, all tense
ME - long tense versus short lax vowels

A short excursus is necessary here to explain in what sense this importation of [± tense] is advantageous. One long-standing phonetic/phonological debate has concerned the existence of phonetic correlates of tenseness and laxness, and perhaps the definitive paper here is Wood (1975). Wood used X-ray tracings of vowel articulations in five languages to demonstrate that tense and lax vowels in pairs tend to be distinguished by three main articulatory factors:

- tense vowels have higher pharyngeal volume
- tense vowels involve a greater degree of constriction
- among rounded vowels, tense vowels are produced with more lip-rounding than the corresponding lax vowels.

Wood further comments that tense vowels tend to be long and lax vowels short, but rejects this as a distinguishing criterion on the grounds that "the relationship between *tenseness* and *quantity* can vary synchronically from language to language and diachronically from period to period in one and the same language" (Wood 1975, p.110). This possibility of variability in the length-tenseness correlation will prove important in the analysis of both MEOSL and the Scottish Vowel Length Rule.

The most important distinction between tense and lax vowels in relation to MEOSL is the second mentioned above; Wood's X-ray tracings show that lax vowels will characteristically be produced with a lesser degree of constriction than their tense counterparts. It seems reasonable, then, to propose that one consequence of the introduction of the feature [± tense] into the distinctive feature inventory of ME, and the concomitant laxing of these short vowels, might be an apparent lowering of these new lax vowels. The lowering might not involve a full degree of height, but would be enough to disassociate /i u/ from long /i: u:/ and /e o/ from /e: o:/, and to make it more likely that the previously high short vowels would merge with the long high-mid vowels, and similarly the previously high-mid vowels with the long low-mid ones, in case of lengthening.

I assume, then, that the short vowel system at the time of Pre-Cluster Lengthening in the 10th Century consisted of the vowels /i e a o u/, all tense, but that by the 12th Century and the operation of MEOSL, the short vowels were lax /ɩ ɛ a ɒ ʊ/. This hypothesis helps account for the facts of MEOSL, and will also prove crucial to the statement of the Scottish Vowel Length Rule below.

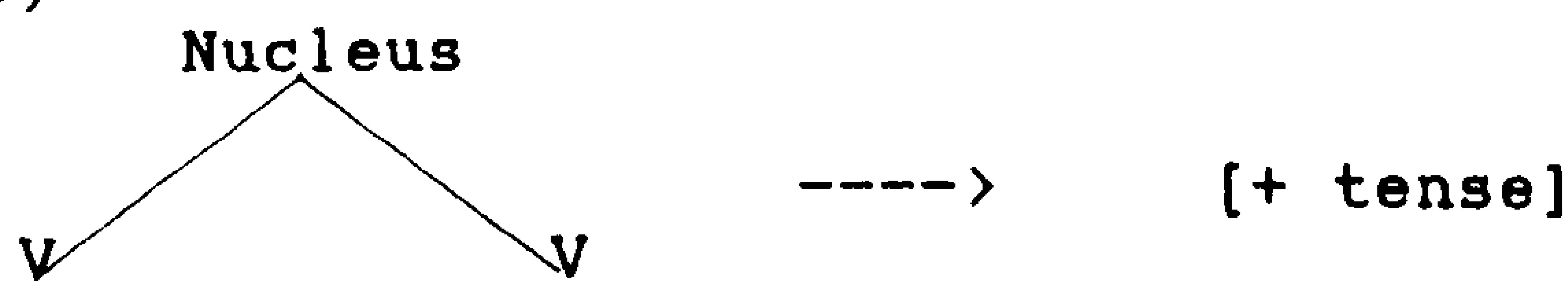
Despite the usefulness and plausibility of this proposal, it must be noted that no explanation as to why ME should suddenly have acquired the feature [± tense] has so far been suggested. The answer may lie in the suprasegmental organisation of the language.

During ME, the English stress system was undergoing a radical change, with the introduction of the phonologically determined Romance Stress Rule via French loans, alongside the earlier Germanic Stress Rule, which was morphologically determined and assigned a main stress to the first syllable of each stem. Although syllable weight as a phonological variable appears to have existed in OE, for instance as a factor determining the assignment of secondary stress, the introduction of the Romance Stress Rule initiated a more pervasive correlation between syllable weight and stress; the rule scans words right-to-left, and preferentially stresses heavy syllables (final in verbs, penultimate in nouns). If the first relevant syllable is not heavy, the stress is placed on the previous syllable, regardless of weight.

Hyman (1977, pp.47-49) notes that languages with a heavy versus light syllable dichotomy, i.e. a stress assignment system that makes reference to syllable weight, always have a vowel length contrast (although length contrasts per se are not confined to languages with phonologically determined stress rules, as OE and Polish, for instance, demonstrate). In addition, in languages where syllable weight is a phonological variable and there is a length contrast, there is almost always a quality distinction between long and short vowels of the 'same' height. When English, which already had a vowel-length contrast, borrowed the Romance Stress Rule, which refers to syllable weight, it might therefore be expected to acquire a tenseness, and thus a quality distinction between long and short vowels. Anderson

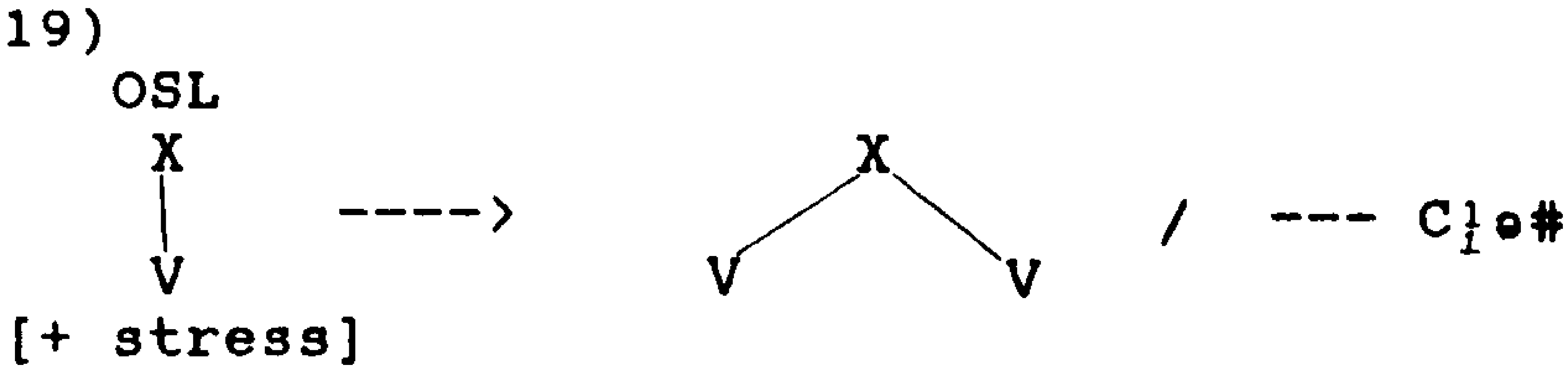
(1984) takes this argument one step further, with the contention that languages will tend to implement a redundancy rule which correlates underlying length, or nuclear complexity, with the phonological feature of tenseness (18).

(18)



The proposal that ME had acquired the feature [± tense], for whatever reason, allows a more explanatory formulation of MEOSL, which takes into account the proposed quality change as well as the generally agreed lengthening. Lieber (1979, p.12) in fact proposes a complex of rules and conditions. The actual Open Syllable Lengthening Rule (19) has as input the set of short, and now lax, vowels.

(19)



(partly after Lieber and Minkova)

At about the same time, Lieber assumes that a Lowering process applied to the resultant long, lax vowels. It might seem that this rule is no longer necessary, given the laxing and concomitant lowering of short vowels in the period between OE and ME which was discussed above. However, as I suggested earlier, the lowering due to laxing may very well not have involved an entire degree of height, so that Lieber's Lowering rule (20) should probably be retained, and seen as an exacerbation or phonologisation of a tendency begun by the introduction of [± tense].

(20)

$$\text{Lowering}\quad \begin{bmatrix} +\ \text{long} \\ -\ \text{tense} \\ \langle -\ \text{high} \rangle \end{bmatrix} \quad ----> \quad \begin{bmatrix} -\ \text{high} \\ \langle +\ \text{low} \rangle \end{bmatrix}$$

(Lieber 1979, p.13)

A redundancy rule, approximating to Anderson's (see (18) above and (21)) is then implemented: this correlates length with tenseness and thus makes these long lax vowels tense, so that /e:$_l$/ falls in with /e:$_t$/, /o:$_l$/ with /o:$_t$/, /ɛ:$_l$/ with /ɛ:$_t$/, and /ɔ:$_l$/ with /ɔ:$_t$/.

(21)

[α long] ---> [α tense]

This analysis clearly captures the requisite vowel mergers. However, Lieber herself (1979, p.14) raises a possible objection - perhaps:

"...a rule which creates long, lax vowels...is theoretically undesirable, since it creates a distinction between long, lax vowels and long, tense vowels that is utilised by our lowering rule, and subsequently neutralised close to the surface by [the redundancy rule], which correlates length and tenseness. Thus, it may be argued that laxness is being used as a diacritic to mark just these vowels that must be lowered."

There are, however, three types of evidence which can be adduced to show that Lieber uses the tense - lax distinction as more than a diacritic: articulatory evidence from Wood (1975), the facts of certain northern dialects of Modern British English, and rhyme evidence from Chaucer. I shall deal with these in turn.

5.2.2.1. Articulatory Evidence

Evidence based on the X-ray tracings in Wood (1975) has already been cited in support of the lowering and laxing of the OE short (tense) vowels. Similarly, Wood's results indicate that the tongue height of a long, lax vowel will tend to be closer to that of a long, tense vowel of one degree less in height than to that of a long, tense vowel of the same height. Indeed, lax [I:] was often produced with a lower tongue height than tense [e:] in Wood's experiments. These articulatory facts also help explain the Lowering rule above; if lax /ɪ ɛ ʊ ɒ/ were lengthened by MEOSL, the resultant [ɪ: ɛ: ʊ: ɒ:] would be articulatorily closer to /e: ɛ: o: ɔ:/ than to /i: e: u: o:/ respectively. The mergers which occurred as a result of MEOSL can therefore be accounted for on the grounds of articulatory similarity, if we assume a tense-lax distinction for long vowels.

5.2.2.2. Modern Northern English Dialects

In Yorkshire, Derbyshire, Lancashire, Staffordshire and other northern and north Midland areas of England, [ɛ:] and [ɔ:] from MEOSL have become ModE [eI] and [ɔ̧i], while older /ɛ:/ (<OE /æ:/) and /ɔ:/ (<OE /ɑ:/ and French loans) have developed to [iə] and [uə]. These facts suggest that "the reflexes of short vowels in open syllables and of original OE long vowels were still kept distinct in the ME dialect from which the modern north Midland and northern dialects derive" (Lieber 1979, p.16). It is at least possible that the members of these vowel pairs were distinguished via [± tense], with OE /e o/ becoming low-mid, long and lax, while ME /ɛ: ɔ:/ remained low-mid, long and tense. To produce this situation in a dialect, one need only assume that the redundancy rule correlating length and tenseness was not implemented after MEOSL. Long tense and lax vowels would then be allowed to co-exist, and might be expected to develop differently.

5.2.2.3. Rhyme Evidence from Chaucer

Dobson (1962) quotes a stanza from Troilus and Cryseyde, with rhyme scheme ABABBCC, which exhibits the rhymes shown in (22).

(22)

	A	loore	[ɔ:] < OE /ɑ:/
MEOSL	B	forlore	[ɔ:] < OE /o/
	A	more	[ɔ:] < OE /ɑ:/ (Comp. Adj.)
MEOSL	B	more	[ɔ:] < OE /o/ ('root')
MEOSL	B	bifore	[ɔ:] < OE /o/

It is inconceivable, given Chaucer's rhyming practice, that he would have rhymed all five consecutive lines as A. This suggests that the A-line vowels and the B-line vowels must have been distinct at this time, perhaps as [ɔ:$_{l}$] versus [ɔ:$_{t}$]. After all, MEOSL did not operate long before Chaucer's time, and one might expect some kind of residue; perhaps the redundancy rule Lieber posits had not yet been introduced. However, neither the ME orthography nor traditional IPA notation, without additional diacritics or subscripts to show tenseness and laxness, are subtle enough to show the necessary distinctions.

It seems, then, that a combination of Minkova's revised environment and Lieber's complex of rules and conditions offers the most adequate and explanatory account of MEOSL. After MEOSL, the monophthongal vowel system in (23) can be assumed for both Northern and Southern ME.

(23)

Short		Long	
ɪ	ʊ	i:	u:
		e:	o:
ɛ	ɔ	ɛ:	ɔ:
a		a:	

5.2.3. /o:/-Fronting (Late 13th - Early 14th Century)

This sound change involved the fronting of /o:/ (from the sources specified in (8) above and also /u/ by MEOSL) to /ø:/ in all contexts, and operated in the same Northern areas in which /ɑ:/ had earlier fronted to /a:/- that is, Scotland, Northumberland, Cumberland, Durham, North Lancashire and Yorkshire. The variant realisation of this /ø:/ in Modern English dialects will be discussed below, under Stage 1 of the Great Vowel Shift.

Although the symbol /ø:/ represents a high-mid front rounded vowel, it is impossible to determine the precise realisation of the segment in the 13th and 14th Centuries, and there is some evidence to support the contention that the vowel may in fact have been high rather than high-mid:

- Cross-linguistically, it is extremely marked for a language to have mid or low front rounded vowels without high /y/, but early Scots had no contrastive /y/.
- OF /y:/, introduced via loan words, merged with /ø:/ in the North.
- /ø:/ was written <u> or <ui>, suggesting that Norman scribes identified it with their /y/, written <u>.

On the other hand, it is possible that this merger, and the graphemic identification, took place simply because /ø:/ in the North was the closest vowel to French /y(:)/, being the only front rounded vowel in the system; the two need not have been phonetically identical.

The long vowel system resulting from /o:/-Fronting in the North, assuming /ø:/ rather than /y:/, is given in (24). The Southern system, of course, remains as in (23) above.

(24)

	North	
i:		u:
e:	ø:	
ɛ:		ɔ:
a:		

5.2.4. Pre-/x/ Diphthongisation (Early 14th Century)

Before the voiceless velar fricative, certain vowels diphthongised, with a front /i/ glide developing after front vowels, and a back /u/ glide after back vowels (see (25)). This diphthongisation was confined to England and the Scottish Borders, and is therefore not reflected in Edinburgh-based literary Older Scots.

(25)

slaughter	/slaxtər/ > /slauxtər/ > RP /slɔ:tə/, Scots /slaxtər/
dough	/dɔ:x/ > /dɔux/ > RP /doʊ/, Scots /da:x/, with /a:/ from Long Low Vowel Raising
fight	/fɛxt/ > /fɛixt/ > RP /faɪt/, Scots /fɛxt/
right	/rɪxt/ > /ri:xt/ > RP /raɪt/, Scots /rɪxt/
bough	/bux/ > /bu:x/ >RP /baʊ/, Scots /bux/

As (25) indicates, forms like /fɛxt/ and /rɪxt/ are still characteristic of many modern Scots dialects: SSE, however, has adopted more RP-like pronunciations.

5.2.5. /v/-Deletion (c.1300)

In both the North and the South, /v/ vocalised intervocalically, and deleted between /a/ and a sequence of vowel plus syllabic consonant (26).

(26)

/v/ > /u/ / V --- V
/v/ > ø / /a/ --- VC

hawk /havək/ > /hauk/ (> /hɔ:k/)
had /havdə/ > /hadə/ (> /hæd/)

Scots, however, had a more general version of this process, formalised in (27); this is responsible for the synchronic lack of [v] in the Scots dialect forms of *give*, *love*, and *devil* (although in SSE these are [gɪv], [lʌv] and [dɛvəl], roughly as in RP).

(27)

$$/v/ \;>\; ø \;/\; \begin{matrix} V \text{ --- } V \\ \text{---- } C \end{matrix}$$

give /ge:və/ > /ge:ə/ > /ge:/ > /gi/ <gie>
love /lø:və/ > /lø:ə/ > /lø:/ <lo>
devil /de:vəl/ > /de:əl/ > /de:l/ > /dil/ <deil>

5.2.6. /l/-Vocalisation (2nd Quarter of the 14th Century)

This change operated in two stages, the first general and the second confined to the North and Scotland (28).

(28)
Stage 1:

$$\{/u\ ɔ\ a/\} > \{/u\!:\ ɔu\ au/\} \;/\; \text{---}\ /l/\left\{\begin{matrix} Ç \\ \# \end{matrix}\right\}$$

Stage 2:

$$/l/ > ø \;/\; /u\!:\ ɔu\ au/ \text{---}\left\{\begin{matrix} Ç \\ \# \end{matrix}\right\}$$

/al/ > /aul/	>	Scots /ɔ/	RP/SSE /ɔl/
		/sɔt/	/sɔlt/ 'salt'
/ɔl/ > /ɔul/	>	Scots /ʌu/	RP/oʊl/, SSE /ol/
		/nʌu/	/noʊl/, /nol/ 'knoll'
		/gʌud/	/goʊld/,/gold/ 'gold'
/ul/ > /u:l/	>	Scots /u/	RP /ʊl/, SSE /ul/
		/pu/	/pʊl/, /pul/ 'pull'

There are, however, one or two qualifications. Firstly, /l/ is lost in all dialects after /a/ and before a labiodental or labial consonant, as in *half*, *calm*. Secondly, the sequence /ald/ does not undergo the second stage of /l/-Vocalisation in the North and Scotland (as shown in (29)), or at least does not generally seem to, although isolated spelling like <scaud> 'scold', <had> 'hold' (in The Wyf of Auchtermuchty) can be found.

(29)
/ald/ > /auld/ > RP /oʊld/, SSE /old/
Scots /ɔld/, /ald/ */ɔd/, */ad/

Aitken (1976; Notes p.6) attempts to account for this exceptional behaviour by proposing that /a:/ > /au/ in this context, before the operation of /l/-Vocalisation, supposedly bleeding the latter change. However, as Agutter (ms.) points out, /aul/ is an operational context for Stage 2 of /l/-Vocalisation, and should feed into the change at this point. It seems, then, that there is no principled reason for the exceptionality of /ald/ in Scots.

5.2.7. Monophthongisation of /ai/

One final, minor change should be noted before we proceed to a consideration of the Great Vowel Shift (GVS). This is the monophthongisation of /ai/ to /a:/ word-finally in Scots, in a few words of frequent occurrence such as *day*, *say*, *lay*, *away*, and perhaps *pay* and *way*. This /a:/ will eventually raise to /e:/ in the GVS, giving Modern Scots and SSE /de/ 'day', etc.. /ai/ word-finally in other lexical items remains a diphthong, developing to Modern Scots [ʌi] or [a:i], as in *aye* 'ever', *clay*, while /ai/ medially again undergoes the GVS and emerges as /e:/. The vowels of Modern Scots /de/ *day* and /ren/ *rain* therefore have the same early Scots source and the same Modern Scots output, but have followed slightly different diachronic routes.

To account for the development of the vowel in *eye*, *die* to Modern Scots dialect /i:/, I will assume with Aitken (1976, Notes) that /ei/ also monophthongised to /e:/ in Scots before the GVS. This vowel will then raise regularly to /i:/. Similarly, /ei/ in the South may have become /i:/ to produce /ai/ via the GVS, although I am not sure when or how this change occurred.

The inventory resulting from these processes is shown in (30).

(30)

South

short		long		diphthongs		
ɪ	ʊ	i:	u:	iu		ui
		e:	o:			
ɛ	ɒ	ɛ:	ɔ:	ɛu	ɔi	ɔu
a		a:		au	ai	

North

short		long		diphthongs		
ɪ	ʊ	i:	u:	iu		ui
		e: ø:				
ɛ	ɒ	ɛ:	ɔ:	ɛu	ɔi	ɔu
a		a:		au	ai	

The main difference between North and South is the presence of /ø:/ and concomitant absence of /o:/ in the North of England and Scotland. However, some vowels which are present in both systems have different sources and greater or lesser functional load in each. For instance:

- /ɔ:/ in the South is from Long Low Vowel Raising of /ɑ:/, MEOSL of /o/ and French loans. In the North, it has only the last two sources.
- /e: o:/ in the North have an extra source, i.e. MEOSL of /i u/ which did not lengthen in the South.
- /au ɔu ɛi i: u:/ are all produced by Pre-/x/ Diphthongisation in England and the Borders, but not in Central Scots.

5.2.8. The Great Vowel Shift

The long vowel inventories of (30) were next affected by a series of changes which, seen in retrospect, form the Great Vowel Shift (GVS). I do not intend to formulate this as a unitary sound change, or to examine the various mechanisms and motivations which have been proposed for the shift; for instance, I will not address in detail the problem of whether the subshifts of the GVS constituted a push- or a drag-chain (see King 1969, Chomsky and Halle 1968, Lass 1976). My aim is simply to detail the individual changes involved in the historical

GVS and to consider the effects these had on the Northern and Southern vowel systems. I shall list the stages of GVS below in roughly chronological order. It seems likely, given the available spelling, rhyme and orthoepical evidence, that the first stage began in the North Midlands during the first half of the Fifteenth Century, with each stage being implemented approximately 50 years earlier in the North than in the South.

5.2.8.1. Stage 1 (c.1400-1450 N., 1450-1500 S.)

In this earliest subshift of the GVS, high-mid front (and, in the South, back) long monophthongs raised, while originally high long vowels diphthongised (31). The failure of /u:/ to diphthongise in the North, leading to Modern Scots dialect pronunciations like /ku/ *cow* and /hus/ *house* versus RP (and SSE) /kaʊ/, /haʊs/, constitutes the primary evidence for the push-chain view of the GVS. Proponents of the push-chain interpretation point out that there is no /o:/ in the Northern system, due to the previous application of /o:/-Fronting, and since there is no /o:/ to raise, there is no pressure on /u:/ to diphthongise. Consequently, this stage of the GVS in the North affects only front vowels.

(31)

i:	time	SOUTH ONLY		u:	out
↑				↑	
e:	green		do	o:	
Ii/ei					ʊu

The high vowels are shown as shifting to [Ii] or [ei] and [ʊu], rather than directly to [ai] and [au], their eventual values, because an immediate full shift would merge /i:/ with /ai/ and /u:/ with /au/, although subsequent developments of the original /ai/ and /au/ diphthongs indicate that the two sets of vowels remained distinct. In other words, lexical items with original ME

/iː uː/ and /ai au/ surface in Modern English with different vowels, so that /iː/ may not shift to /ai/, nor /uː/ to /au/, until /ai/ and /au/ have in turn moved away from these values; whether or not we regard avoidance of merger as a general linguistic tendency (see Lass 1976), it is clear empirically that no merger took place in this case.

Agutter (ms.) holds that Northern /øː/, as a high-mid vowel, may also have been affected by the GVS at this stage, shifting to /yː/. She concedes that no spelling or rhyme evidence will be available to verify this change, since only one front rounded vowel is ever present in the Scots system, whatever its actual quality at any particular time, and therefore no contrast is involved. However, she argues for this proposed shift on the grounds that the resultant system would accord better with the general Germanic pattern. It is true that there is a strong tendency, perhaps virtually an implicational universal, for languages to have either /y/ alone, or /y ø/, or /y ø œ/ in their front rounded vowel systems, but not the non-high vowels without the high one. However, assuming a GVS shift of /øː/ > /yː/ to fit in with this tendency creates certain problems for the description of Modern Scots, since some dialects still retain high-mid front rounded /ø/ without contrastive /y/ - although it should be noted that many Scots speakers have phonetically fronted [y] or [ʉ] as the major allophone of /u/.

Aitken (1977) distinguishes three Modern Scots dialect-specific patterns of realisation of earlier Scots /øː/ (see (32)).

(32)

SVLR long contexts	elsewhere
e.g. *floor*	e.g. *foot*
A [øː]	A [ø]
B [iː]	B [I]
C [eː]	C [ø], [I]

In order to account for this dialectal variation, it seems that a GVS raising of the sort proposed by Agutter, followed by unrounding, would have to be posited for /ø:/ in dialects of Type B, while /ø/ would be retained, with length variation controlled by the Scottish Vowel Length Rule, in Type A dialects. Type C dialects are rather more complex; unrounding alone seems to have operated in SVLR long environments, and either no development or unrounding of /ø/ and merger with the articulatorily closest vowel, /I/, elsewhere. This occurrence of [I] or [ø] in short contexts rather than the expected short [e] may provide evidence for the relative chronology of raising and rounding relative to SVLR: perhaps the raising in Type B dialects took place before SVLR began to operate, so that /ø:/ > /y:/ > /i:/, which then split regularly into long and short allophones by SVLR, but the unrounding of /ø/ > /e/ took place only after SVLR in some dialects of Type C, and affected only the long allophone.

This dialect evidence is problematic for Agutter's proposal of general raising of /ø:/; this vowel could only participate in the GVS in a subset of Northern dialects. Furthermore, the shift of /ø:/ > /y:/ by GVS violates the prevalent notion that this sound change as a whole constituted a chain shift (of whichever kind). The other shifts involved took place within either the front unrounded or back rounded series of vowels, with a gap in the system causing a breakdown in the cycle of shifts. However, the front rounded vowel /ø:/ is isolated rather than forming part of any series, and there is thus no motivation for its raising within the framework of GVS seen as a unitary phenomenon.

There seem to be two possible solutions to the problem outlined above; both start from the assumption that any /ø:/ > /y:/ raising did not form part of the GVS.

1. Some Northern dialects retained /ø:/ and may subsequently have unrounded it, while others raised it to

/y:/ as a separate, minor change unconnected with GVS. This /y:/ then unrounded to merge with /i:/ (from earlier /e:/ and some /ɛ:/ by GVS) at some time before the operation of SVLR.

2. It was noted earlier, in connection with /o:/-Fronting, that /o:/ need not have simply fronted to /ø:/ in all dialects; it may also have raised, since Norman scribes equated it orthographically with their high front rounded /y/ <u>, while /y/ from French loans also fell in with this vowel. Perhaps /o:/ merely fronted in some dialects, but simultaneously fronted and raised in others. This hypothesis would predict that the latter set of dialects should correspond to Modern Scots dialects with /i/ for earlier /ø:/, while the descendants of the former set should belong synchronically with Type C in (30) above. This possibility seems promising, but more detailed investigations into the development of /ø:/ in individual Scots dialects must be carried out before these predictions can be verified.

5.2.8.2. Stage 2 (c.1450-1500 N, 1550-1620 S)

Whereas Stage 1 of the GVS affected the vowel systems of the Northern and Southern dialect areas rather differently, Stage 2 produced the same results in both areas (33).

(33)

e:
↑
ɛ: meat   eu ← u few   ɛi ← ai rain
↑
a: name

There is one North-South discrepancy here, however: while in the South, /ai/ in all contexts raised to /ɛi/ (and subsequently to /e:/, as demonstrated above), /ai/ in Scots and the North had already monophthongised to /a:/ where it appeared word-finally in frequently-occurring lexical items; this /a:/ merged with earlier

Northern /a:/ and thus raises to /ɛ:/ in Stage 2 of the Vowel Shift. However, in certain dialects of Scots, /a:/ failed to raise to /ɛ:/ and subsequently to /e:/ when preceded by a labial consonant. In this case, /a:/ might be retained, or, in other areas, the influence of the adjacent labial appears to have caused a backing and rounding of /a:/ to /ɔ:/. This change must, however, be assumed to have occurred after the GVS, since this /ɔ:/ does not merge with pre-existing /ɔ:/ and raise to /o:/ (by Stage 4 of the GVS; see below). These variant developments of earlier /a/ mean that a word like *two* can be variably realised in Modern Scots dialects as shown in (34); the SSE form is again more anglicised [tu:].

(34)
[twa:] - /a:/ retained
[twe:] - /a:/ shifted to /ɛ:/, then to /e:/, despite the labial context.
[twɔ:] - /a:/ backed and rounded

5.2.8.3. Stage 3 (c.1490-1510 N, 1600-1630 S)

(35)

ɛi > ɛ:	rain					
			ɔu	>	ɔ:	grow (S only)
au > ɒ:	law					

Stage 3 of the GVS is summarised in (35) above. The subshift of /au/ to /ɒ:/ is based on Johnston's (1980) account of the GVS, and may seem rather controversial; Agutter (ms.), for instance, proposes a monophthongisation of /au/ directly to /a:/ or /ɔ:/, which remain as /a/ or /ɔ/ in different sets of Modern Scots dialects. However, this direct split hypothesis poses some problems, since /au/ > /ɔ:/ would then be ordered before the raising of /ɔ:/ > /o:/ in the final stage of the GVS, so that a merger of words with earlier /ɔ:/ and /au/ at /o:/ would be predicted. This merger simply is not attested: compare Modern Scots *law, cause,* *saw*, where /au/ > /ɔ/ or /a/, with *throat*, *coal*, where the /ɔ:/ > /o:/ shift took place. Johnston avoids this problematic merger by assuming a monophthongisation of /au/ to /ɒ:/, an intermediate representation which then shifts to /ɔ:/ in the final stage of the Vowel Shift, but only after earlier Scots /ɔ:/ has raised to /o:/. To account for Modern Scots variation between /ɔ/ and /a/ for pre-GVS /au/, we might assume that /ɒ:/ split to /ɔ:/ or /a:/ dialect-specifically during the final stage of the GVS, or that /au/ perhaps monophthongised to /ɒ:/ or /a:/ in different dialects in the first place. These possibilities will not be pursued here, since both produce the desired distributional pattern for the relevant vowels in Modern Scots; /a:/ will in either case fall in with the /a:/ retained after labial consonants, and will participate no further in the Vowel Shift.

In the South, /au/ shifts in all cases to /ɒ:/, and subsequently to /ɔ:/, under this analysis.

Two further discrepancies between North and South are relevant to this stage of the GVS.

- Whereas in the South all /ɛi/ (< /ai/) monophthongised to /ɛ:/, in the North this development took place only medially. Where /ɛi/ occurred word-finally in the North (and, it will be recalled, this will be the case only in relatively uncommon words, since final /ai/ in frequently-occurring words had earlier monophthongised to /a:/), it failed to participate further in GVS, but remained diphthongal and developed to Modern Scots /ai/. This accounts for the differing pronunciations of Modern Scots *pail*, *pair*, *rain* with earlier medial /ɛi/ and thus modern /e/, and *clay*, *aye*, with final /ɛi/ < /ai/, and modern /ai/.
- /ɔu/ monophthongised to /ɔ:/ only in the South, raising in the final stage of GVS to /o:/ and subsequently diphthongising to give RP /oʊ/. In the

North, however, /ɔu/ is retained and later becomes /ʌu/, as in *grow*, [grʌu].

5.2.8.4. Stage 4 (c.1500-1550 N, 1690-1715 S)

(36)

e:	>	i:
ɛ:	>	e:
ɔ:	>	o:
ɒ:	>	ɔ:
eu	>	iu

In this final complex of shifts, the mid-front and low-mid back monophthongs raised, with /ɒ:/ becoming /ɔ:/, while the first element of the /eu/ diphthong also raised, giving /iu/ (see (36)). As noted earlier, the /ɔ:/ > /o:/ subshift must have been chronologically ordered before /ɒ:/ > /ɔ:/ to prevent merger at /o:/; Johnston (1980) assigns approximate dates to each subpart of the GVS, and his dating of c.1520 for /ɔ:/ > /o:/ and c.1550 for /ɒ:/ > /ɔ:/, both in the North, accords well with this assumption.

After the completion of the GVS proper, several minor changes of lowering and unrounding took place (37). These can probably be dated to the first half of the 16th Century in the North, and about a century later in the South, but should not be considered as part of the Great Vowel Shift, since they affected short vowels.

(37)

ɩ → ɪ   ʊ → ʌ   ui → ʌɪ

The lowering of /ʊ/ to /ʌ/ was complete in Scots and partial in the South, and failed in the North of England, producing the present-day division of dialects with only /ʌ/, both /ʊ/ and /ʌ/, or only /ʊ/.

In Scots, /ɔu/ also underwent unrounding of the first element to give /ʌu/, and /ɛi/ developed, perhaps via /əi/, to merge with /ʌi/ < /ui/.

5.2.9. The Output of GVS in the North

The vowel system of the North and Scots at the time of completion of the Great Vowel Shift and the minor changes listed in (37) is shown in (38).

(38)

short			long			diphthongs		
ɪ		ʌ	iː		uː			(iu)
ɛ		ɒ	eː	øː	oː	ɔi	ʌu	ʌi
	a			aː	ɔː			

Note that /ɛː/ has been lost completely through the operation of GVS, while /aː/ and /ɔː/ are fairly marginal; /aː/ occurs only in certain dialects for earlier /aː/ (including /aː/ < /ai/) after a labial consonant, as in *two* [twaː], *away* [əwaː], while /ɔː/ has the same origin in a different set of dialects, in which earlier /aː/ backed and rounded under the influence of a preceding labial - so [twɔː], [əwɔː]. Furthermore, earlier /au/ had monophthongised to either /ɔː/ or /aː/ in words like *law*, *craw* 'crow', giving one additional source for these vowels.

The system given in (38) constitutes the input to the last important process to be discussed here: the Scottish Vowel Length Rule.

5.2.10. The Scottish Vowel Length Rule

"A typically English dialect is one which preserves a reflex of the West Germanic system of phonemic vowel length, having one set of lexically short and one of lexically long stressed vowel phonemes....Scots dialects, on the other hand, are characterised by the disruption of this dichotomous pattern, resulting in the loss of phonemic length: vowel duration is to a large extent conditioned by the phonetic environment" (Harris 1985, p.14).

The process generally assumed to be responsible for this loss of contrastive vowel length in Scots is the Scottish Vowel Length Rule (SVLR) or Aitken's Law, so-called after A.J. Aitken, who first proposed the rule in 1962 (although its effects had been observed earlier; see Chapter 5). SVLR is also cited as a rule in the synchronic phonology of Modern Scots dialects and SSE by, for instance, Abercrombie (1979), Aitken (1981), McClure (1977), and Wells (1982). The synchronic SVLR was mentioned briefly at the beginning of this chapter, and a preliminary formulation appears in (6) above; further discussion of the synchronic characterisation of this rule will occupy much of Chapter 5 below, but I shall concentrate here on the historical version of SVLR.

The first aspect of the historical SVLR we should attempt to ascertain is its approximate date. Although some accounts of SVLR do stipulate a date for the commencement of this sound change, the dates proposed vary widely and little evidence is presented to support them. Lass (1976, p.54) opts for a 17th Century date; McClure designates SVLR as "a sixteenth-century sound change in Scots" (1977, p.10); and Aitken half-commits himself to an earlier introduction "? in the fifteenth century" (1981, p.137). However, these dates are inadequately substantiated: only Johnston (1980) and Harris (1985) produce arguments for their assumed datings, and neither is absolutely conclusive.

Johnston (1980, p.380) opts for the period 1600-1640, "sometime between the monophthongisation of NME /iu/ and the lowering of the high short vowels"; the last change mentioned is shown in (37) above. However, Johnston stipulates that SVLR must precede lowering because he assumes that /i u/, which failed to lengthen by SVLR, are exempt on account of their height. This hypothesis cannot account for the fact that the originally long high vowels /i: u:/ were affected by SVLR. We shall see later that the non-lengthening of earlier /i u/ might in fact be better explained if lowering is assumed to have taken place prior to the operation of SVLR. Furthermore, the date (from Dobson 1962) which Johnston accepts for lowering of /i u/ may be rather late: the process may well have been 16th rather than 17th Century in the North, since it is generally assumed to have operated immediately after the GVS, the last stage of which Johnston himself dates to c.1500-1550 in the North, although over a century later in the South. Dobson's late date for lowering may therefore hold only for Southern dialects.

It seems, then, that:

1. If SVLR took place after the lowering of /i u/, it could still have been a 16th Century process.
2. If lowering did operate in the 16th Century in the North, and if Johnston is correct in dating SVLR before lowering, SVLR must have been introduced in the 16th Century at the latest.

Some further evidence for an earlier dating comes from Harris (1985, p.23), who proposes a 15th Century date on the grounds that SVLR operates in Ulster Scots, at least for some vowels. Harris argues that, since most Scottish settlers of Ulster migrated from the peripheral dialect areas of southwest Scotland during the Plantation of Ulster from 1601 onwards,

"the Aitken's Law changes must presumably have begun their diffusion outwards from the core dialects of central Scotland well before the seventeenth century if they were to be sufficiently advanced in southwest Scots before the Plantation of Ulster."

However, Harris also asserts that

"the shortening of historically long vowels...post-dates the early stages of the Great Vowel Shift, since these vowels all appear in their shifted shapes" (1985, p.23).

Thus, *divine* has short [ʌi] in Modern Scots and SSE, shifted from earlier /i:/; similarly, *meat* has [i] from pre-GVS /e:/, and *coal*, [o] from /ɔ:/: if SVLR had preceded GVS, these vowels, in SVLR short contexts, would have been short and therefore ineligible for shifting. Johnston, in his account of the Great Vowel Shift, places the /e:/ > /i:/ and /ɔ:/ > /o:/ subshifts responsible for the synchronic forms of *meat*, *coal* during the last stage of the GVS, which, as we have seen, he dates to around 1500-1550 in the North. Thus, SVLR should be dated after this, perhaps in the second half of the 16th Century.

Lass (1974, 1976) also accepts a post-Vowel Shift date for SVLR, and attempts to motivate both GVS and SVLR teleologically; broadly, his argument is structured as follows:

1. Before the operation of either sound change, the ME and Older Scots long vowel systems had four contrastive heights, although the short vowel system common to both had only three.
2. Four-height vowel systems with phonemic length distinctions seem to be unstable in Germanic, and other Germanic languages have undergone sound changes which either reduce the number of vowel heights in the system, or dispose of contrastive vowel length, or both.
3. In English, the Great Vowel Shift produces a three-height long vowel system, bringing it into line with the original pre-GVS short system, and in Scots alone, SVLR subsequently dephonemicises vowel length.

Lass actually sees the historical SVLR as composed of the subrules given in (39).

(39)
"(a) All long vowels (and diphthongs) shortened everywhere except before /r v z ʒ ð #/
(b) The nonhigh short vowels /ɛ a ɔ/ lengthened in the same environments."
(Lass 1974, p.320)

Whether or not one believes in directed linguistic evolution (a concept which Lass himself later rejects:

see Lass 1980), the effect of SVLR is clear: before its operation, Scots, like other ME dialects, contrasted long and short vowels, whereas afterwards, Scots had innovated a system in which length is non-distinctive. Pullum (1974) argues for such a reanalysis of the underlying Scots vowel system as a direct result of the introduction of SVLR, observing that:

> "an immediate or even simultaneous consequence of the addition of a rule like Lass' formulation of Aitken's Law (a) to a grammar would be a restructuring by rule inversion: from underlying vowels *shortened* in all contexts *except* before /r v ð z ʒ #/, the language would shift to having underlying short vowels *lengthened* before /r v ð z ʒ #/."

(40) shows the input and output systems for SVLR, to illustrate this change.

(40)

Input

I		ʌ	i:		u:			
ɛ		ɒ	e:	ø:	o:	ʌi	ʌu	ɔi
	a		a:					

Output

I		ʌ	i		u			
ɛ			e	ø	o	ʌi	ʌu	ɔi
			a		ɔ			

The output system in (40) also provides further support for the laxing and lowering of short vowels which was required above to account adequately for MEOSL. It is clear that we must assume for Modern Scots and SSE a vowel system including /ɛ a ɔ/, since all of these occur in fairly large sets of lexical items (*men, bed, slept* for /ɛ/; *cot, caught, pot, law* for /ɔ/; and *back, trap, car* for /a/). In order to derive such a system via the historical processes discussed in this chapter, the short vowel system prior to the operation of SVLR cannot have been that of OE, i.e. /i e a o u/, since the requisite length adjustments of SVLR would then have produced mergers of /i/ with /i:/, /u/ with /u:/, /e/ with /e:/,

/o/ with /o:/ and /a/ with /a:/, and no source would be available for /ɛ/, while /ɔ/ would remain extremely marginal. We must rather assume that the short vowel system was the one proposed above for the language at the time of MEOSL, i.e. /ɪ ɛ ʊ ɒ a/, with the slight difference that /ɪ ʊ/ had lowered and centralised to /I ʌ/ after GVS. Lass assumes that /a/ then merged with earlier /a:/ and /ɒ/ with earlier /ɔ:/ to increase the functional load of these phonemes, while /ɛ/ lengthened in the appropriate SVLR long environments, fitting into the same system as the originally long vowels as a new underlyingly short vowel with long realisations in contexts predicted by SVLR.

I shall return to the historical Scottish Vowel Length Rule in Chapters 5 and 6 below, making certain emendations to the version presented here; for instance, I shall argue that /ɛ/, like /I ʌ/, is in fact exempt from SVLR, and present evidence to suggest that the merger of tense and lax low vowels mentioned above may not have occurred. However, let us accept this outline of the historical process for the moment, noting that SVLR does not only involve the adjustment of vowel length, but also a disruption of the length-tenseness correlation, which, it was argued in 5.2.2. above, was implemented in ME after the operation of MEOSL. This disruption will be crucial to the synchronic account of SVLR presented in Chapters 5 and 6.

One problem with Lass' account is the lack of any explanation of why /I ʌ/ do not undergo SVLR diachronically along with the other lax vowels, to merge presumably with /e:/ and /o:/. It is possible that the lowering and centralisation that these short vowels had undergone made them too dissimilar in articulatory terms from either /i: u:/ or /e: o:/ to permit merger, but this does not explain their failure to lengthen in SVLR long contexts. However, Harris (1985, p.110) observes that "lengthening processes are likely to affect low vowels before high vowels because of the tendency of the former to be longer for articulatory reasons." This may go some way towards accounting for the exceptional status of /I ʌ/ with respect to SVLR in Older and Modern Scots and SSE.

6. The Modern Scots/SSE Vowel System: Reprise

The core vowel system proposed for Modern Scots dialects and SSE in (3) above, and repeated for convenience in (41), is substantially the same as the SVLR output system of (40) (= (42)).

(41) Modern SSE/Scots Core System

I	i	u			
ɛ (ɛ̈) ʌ	e (ø)	o	ai	au	ɔi
	a	ɔ			

(42) Output of SVLR

I		i	u			
ɛ	ʌ	e ø	o	ʌi	ʌu	ɔi
		a	ɔ			

There are three very minor changes. First, I have altered the representations for the three underlying diphthongs: as noted in 4.2.2. above, this is due to internal synchronic evidence relating to the synchronic application of the Vowel Shift Rule and SVLR in Scots and SSE. We shall return to this matter in Chapter 5. Secondly, I have included the 'Aitken vowel', /ɛ̈/, in the synchronic system; this was not included in any of the intermediate historical systems of Section 5 since, as 4.2.1. above made clear, the source of /ɛ̈/ is uncertain and I am therefore unable to state with any degree of certainty when or how it appeared in the vowel inventory of Scots. Thirdly, I have bracketed /ɛ̈/ and /ø/, to indicate that these vowels are common in Scots dialects but are fairly infrequent among speakers of SSE.

We have now established a Modern Scots / SSE vowel system, and have traced the sources of disparities between this inventory and the RP/GenAm system developed in Chapters 2 and 3. Our next task is to establish the locus of the clear variation between SSE and these other Standard English accents. The main focus of Chapter 5 will be the synchronic formulation of the Scottish Vowel Length Rule, and the consideration of its interactions with other phonological processes, notably the Vowel Shift Rule. The consequences of the presence of SVLR in the phonology of Scots / SSE will be discussed, and will prove to be relevant to the treatment of dialect variation in Standard Generative Phonology and in Lexical Phonology. In Chapter 6, we will return to the diachronic domain, revising the account of the historical SVLR from section 5 above, and considering the relationship between sound changes and synchronic phonological rules which becomes apparent given a lexicalist model.

Chapter 5

Lexical Phonology, Dialect Differentiation, and the Scottish Vowel Length Rule

1. Introduction

Most generative analyses of modern English phonology have tended, as SPE did, to concentrate on General American. This is equally true of recent lexicalist phonologies of English, although Halle and Mohanan (1985) do include some information on RP. However, as shown in Chapters 2 and 3 above, RP and GenAm are sufficiently similar to allow almost identical underlying segment inventories and rule systems, and the comparison of such closely related varieties is therefore largely irrelevant to any discussion of the treatment of dialect differences in Lexical Phonology. It is for this reason that I have elected to introduce a third reference variety, Scottish Standard English (SSE), which differs fundamentally from both RP and GenAm in its vowel phonology, both on the surface and (arguably) underlyingly.

In the last chapter, we determined the historical sources of synchronic variation between SSE/Scots dialects and RP/GenAm, and found the primary discrepancy to be the innovation of the Scottish Vowel Length Rule (SVLR; see Chapter 4, Section 4.10). The main focus of the next two chapters will be the synchronic characterisation of the SVLR, again assuming a lexicalist model, and an exploration of its links with other phonological rules. However, in line with my practice throughout this thesis, synchronic evidence on SVLR will not be discussed in isolation; further consideration will be given in Chapter 6 to the historical development of SVLR and its connections with another vowel lengthening process which is also operative in RP and GenAm. This in turn will lead to a discussion of the analysis of sound change in LP, and the diachronic relevance of the division of lexical from postlexical rules.

2. The Scottish Vowel Length Rule

2.1. Introduction

One possible underlying vowel system for Scots/SSE was historically derived in Chapter 4. This underlying system will be refined further below, but for the moment let us concentrate on the surface vowel contrasts found synchronically in SSE. A list of vowels and appropriate key words for SSE, RP and GenAm is given in (1), partially recapitulating the comparative material in Chapter 4, Section 4.2. above. Unstressed vowels, and complications resulting from the historical loss of postvocalic /r/ in RP are ignored, although a brief discussion of vowels before /r/ may be found in Chapter 4, Section 4.2.4.

(1)

	RP	GenAm	SSE
beat	iː	iː	i
bit	ɪ	ɪ	ɪ
bait	eɪ	eɪ	e
bet	ɛ	ɛ	ɛ
bat	æ	æ	a
balm	ɑː	ɑː	
bomb	ɒ		ɔ
bought	ɔː	ɔː	
foot	ʊ	ʊ	u
food	uː	uː	
but	ʌ	ʌ	ʌ
boat	oʊ	oʊ	o
bite	aɪ	aɪ	ai
boy	ɔɪ	ɔɪ	ɔi
bout	aʊ	aʊ	au

There are several clear differences between the RP and GenAm systems on the one hand, and that of SSE on the other. However, all of these minor discrepancies can be subsumed under one generalisation, relating to the surface distinction of underlying tense and lax monophthongs. In RP and GenAm, there are six tense-lax pairs, which are listed in (2).

(2) /ī/ - /I/
/ē/ - /ɛ/
/ɑ̄/ - /æ/
/ū/ - /ʊ/
/ō/ - /ʌ/
/ɔ̄/ - /ɒ/ or /ɑ/

The members of these pairs are distinguished partially by length - those on the left are always long, while those on the right are consistently short (for a caveat concerning GenAm /ɑ/, see Chapter 3). However, they are also qualitatively different; the left-hand vowels are more peripheral (the usual phonetic interpretation of the feature [± tense]) than those on the right, and /ē/ and /ō/ are usually diphthongal on the surface, while /ī ū ɑ̄ ɔ̄/ may also attract offglides in some accents. In SSE, this dual distinction of quantity and quality is not operative. Either the members of a pair of vowels are distinguished by quality alone, as is the case for /i/ - /I/, /e/ - /ɛ/ and /o/ - /ʌ/, or the opposition is entirely lacking, as with RP/GenAm /ɑ̄/ - /æ/, /ɔ̄/ - /ɒ/ and /ū/ - /ʊ/, which are each replaced by a single vowel in SSE, conventionally represented as /a/, /ɔ/ and /u/ respectively. /i u e o a ɔ/ are never subject to Diphthongisation in SSE; the only diphthongs here are /ai/, /au/ and /ɔi/ which, I argued in Chapter 2, should be recognised as underlyingly diphthongal for English as a whole. Furthermore, these SSE vowels are not consistently long, since vowel length is not contrastive in SSE and Scots dialects. Instead, length varies according to the phonetic context, and the controlling process is the Scottish Vowel Length Rule.

Before continuing, I should note that, although SVLR operates almost identically in Scots dialects and SSE, the vowels given in (1) above are appropriate primarily for SSE. Some Scots - SSE distributional differences are indicated in (3).

(3)

	SSE	Scots
foot	[u]	[I] or [ø]
floor	[o:]	[ø:] or [e:]
two	[u:]	[a:] or [ɔ:]
snow	[o:]	[ɔ:]
house	[ʌu]	[ʉ]
never	[ɛ]	[ɛ̈]

Most of the discrepancies shown in (3) were more fully discussed in Chapter 4: so, for instance, the alternative vowels found in *foot* and *floor* result from /o:/-Fronting and subsequent dialect-specific unrounding of /ø/ in Scots. The 'Aitken vowel' /ɛ̈/ and front rounded /ø/ do not feature in the SSE column of (1), since they are not frequently encountered outside Scots dialects. Furthermore, the diphthong /au/ is marginal in Scots, since the Great Vowel Shift failed for /u:/ > /au/ in the North, so that /u/ is retained in Scots *house, out, cow* and so on. /au/ is present only in a few place-names like *Cowdenbeath*, some specifically Scots lexical items like *howff* and *loup*, and words with earlier /ɔl/ > /ɔu/ > /au/ via l-Vocalisation, as in *gold* [gʌud] and *knoll* [nʌu]. The SSE column of (3), then, shows cases of assimilation towards RP: thus, most SSE speakers have adopted the /au/ diphthong in words where /u:/ developed regularly to /aʊ/ by the Great Vowel Shift in the South. Indeed, this assimilation can go further than (1) shows: as mentioned in Chapter 4, Section 4.2.3. above, some SSE speakers acquire the oppositions /æ/ - /ɑ/, /ɒ/ - /ɔ/ and occasionally /ʊ/ - /u/, in the order given, from RP (Abercrombie 1979).

Some Scots dialect evidence will be considered in Section 3.2. below, on the low vowels. In the main, however, the discussion of SVLR will focus on SSE, as a reference accent parallel in its own territory to RP and GenAm, the other varieties considered in detail here. It can generally be assumed that SVLR operates equivalently in SSE and Scots, although, in view of the evidence in (3) and in Chapter 4 above, it is clearly an over-idealisation to equate Scots and SSE.

We saw in Chapter 4 (Section 4.10) that the introduction of a bipartite Scottish Vowel Length Rule which shortened long vowels in 'short' contexts and lengthened short vowels in 'long' ones (Lass 1974) followed by rule inversion and restructuring (Pullum 1974) should have produced an underlying Scots vowel system with no oppositions of length. All vowels would instead be underlyingly short, as in the outline system in (4), and a certain subset would lengthen by SVLR in certain environments. A preliminary version of SVLR was given in (6) of Chapter 4, and this is repeated in (5).

(4)								
	I			i		u		
	ɛ (ɛ̈)	ʌ		e (ø)		o	ai au ɔi	
				a		ɔ		

$$
(5)\qquad \begin{array}{c} X \\ | \\ V \\ [?] \end{array} \;\longrightarrow\; \begin{array}{c} X \quad X \\ \diagdown\;\diagup \\ V \end{array} \;/\; \underline{\quad} \left\{ \begin{array}{c} v\ z\ ʒ\ ð \\ r \\ l \\ V \end{array} \right\}
$$

The variable lengthening behaviour of some modern Scots/SSE vowels indicates that SVLR is still operative, and should therefore be further considered from a synchronic perspective. To this end, we must answer a number of questions about the rule. Evidence from previous discussions and formulations of SVLR will be used to ascertain precisely what subset of vowels constitutes the input to SVLR; that is, the question mark in (5) must be replaced by some set of feature specifications. Next, experimental investigations of SVLR will be assessed; these include work by Agutter

(1988a, b), who claims that "the context-dependent vowel length encapsulated in SVLR is not, and perhaps never was Scots-specific" (Agutter 1988b, p.20). The refutation of this assertion will involve a comparison of SVLR with a related lengthening process which, I shall argue, operated in all dialects of English. Chapter 5 will conclude with a consideration of underlying differences between SSE and RP/GenAm, addressing the second question from Chapter 1 on the existence and extent of inter-dialectal variation at the underlying level.

2.2. The Input to SVLR

Although there have been some dissenters (see Agutter 1988a, b and Section 2.3. below), most commentators on Scots phonology, including Abercrombie (1979), McClure (1977), Aitken (1981), Lass (1974) and Wells (1982), implicitly accept the organisation of the SSE/Scots vowel inventory shown in (4), and assume SVLR to be a synchronic process. Lass, for instance, notes that:

> "It is well known that most modern Scots (i.e. Scottish English...) dialects display a type of vocalic organisation radically different from that of non-Scots dialects....Specifically, the treatment of vowel length is of a type not found elsewhere in English" (1974, p.316).

Similarly, Wells (1982, p.398) believes that:

> "The Scottish vowel system is clearly distinct typologically from the vowel systems of all other accents of English (except the related Ulster)....There are no long-short oppositions of the kind found in other accents."

Furthermore, although the rule *per se* was first proposed by Aitken in 1962, the effects of such a lengthening process were anecdotally noted in a number of earlier studies of Scots dialects, such as Murray (1873; Southern Scots), Grant (1912), Watson (1923;

Roxburghshire), Dieth (1932; Buchan), Wettstein (1942; Berwickshire) and Zai (1942; Morebattle).

None of these studies attempts to state the input to, or environment for SVLR formally (an honourable exception being Ewen's (1977) systematic characterisation of the rule in the framework of Dependency Phonology, to which we shall return briefly in Chapter 6). Such a formal statement of SVLR is therefore one goal of this chapter. However, the informal discussions of the process mentioned above do demonstrate general agreement as to the context for the rule and the set of vowels affected.

The SVLR environment will be considered in Chapter 6; for the moment, we shall concentrate on the input to the rule. All the accounts cited above agree that SVLR does not apply completely generally; certain vowels 'opt out' of the process. Dieth, Watson, Wettstein, Zai and the others all propose monophthongal vowel systems including a set of "vowels of variable quantity" (Zai 1942, p.9), which are subject to lengthening in the appropriate SVLR long contexts, i.e. before a voiced fricative, /r/ or before a boundary, since lengthening occurs before inflectional suffixes, even when the consonant following the bracket does not itself constitute a lengthening environment; for instance, the stem vowel is long in *brewed* [bru:d] but short in *brood* [brud]. However, they all include a separate set of consistently short vowels, usually a subset of /ɪ ʌ ɛ ɛ̈/, and sometimes a vowel which is always long, like /ø:/ in Morebattle. I shall discuss the long set, and the diphthongs, first, and then the exceptional short vowels.

If we exclude /ɪ ʌ ɛ ɛ̈/ for the moment, and also defer consideration of the diphthongs, the set of 'lengthenable' monophthongs remaining comprises /i u e o a ɔ/. Aitken (1981) notes that in some dialects, mainly in the Central Scots area, SVLR operates on all these potential input vowels. However, further restrictions operate in other Scots dialects, and Wells (1982) proposes a hierarchy of inputs to SVLR, whereby some speakers will lengthen only the high vowels /i u/, another set of speakers will generalise SVLR to mid /e o/, while still others will apply it to the widest possible range of input vowels, including low /a ɔ/. A further complication is that /a ɔ/, when exceptional to SVLR, tend to be consistently long rather than consistently short like the other 'opting out' vowels. It may be, then, that certain Scots/SSE vowels are underlyingly long; the members of this group, which again may vary from dialect to dialect, include /a: ɔ:/ from Older Scots /au/ and /a:/ (Chapter 4, 4.1., 4.8.2.), /ø:/ from fronted Northern /o:/ (Chapter 4, 4.3.), and perhaps [e:] from earlier /ai/ which, according to Aitken (1981), is consistently long. However, since [e] < /a:/ is generally agreed to undergo SVLR, it seems more likely that these two [e] vowels have merged as lengthenable modern Scots/SSE /e/, a possibility Aitken does admit (1981, p.151). I shall therefore include /e/ in the set of input vowels, regardless of its historical source.

/ø:/ will not be discussed further, as it is found only in certain Scots dialects, and is not characteristic of SSE, the main focus of our discussion here. The situation regarding the low vowels is in fact rather more complex than Aitken's classification of /a ɔ/ as consistently long would indicate, and a fuller discussion of the appropriate number and feature composition of the low vowels in Scots and SSE will be pursued in Section 3. I assume for the moment that /a ɔ/ may be either lengthenable or consistently long in different varieties.

There is also some doubt as to whether all the SSE diphthongs undergo SVLR. /ai/ certainly lengthens, and indeed provides one of the most reliable diagnostics of SVLR, since for this vowel alone there is a qualitative as well as a quantitative difference between the long and the short realisations; /ai/ appears as long [a:i] in *tied* but short [ʌi] in *tide*. However, the sources cited above show less conviction concerning /ɔi/ and /au/. Watson (1923) and Zai (1942) assume lengthening of /ɔi/ only word-finally, as in *boy, annoy*, but the extremely limited distribution of this diphthong makes it hard to draw definite conclusions. /au/ is the most problematic of the three. Watson (1923) assumes that /au/ does lengthen word-finally, giving forms like [kʌu:] *cow*, [yʌu:] *ewe*, but asserts that the long diphthong involved is peculiar to Teviotdale, while Zai (1942, p.14) asserts that long [æ:u] "seems to occur only in the onomatopoetic word *mæ:u* 'to mew like a cat'". Lass (1974) explicitly excludes his /au/ from the SVLR, on the grounds that it is extremely marginal in Scots dialects. This diphthong does occur more frequently in SSE, in items where its appearance is historically appropriate for RP but not for Scots (see Section 2.1. above); /au/ in SSE may therefore constitute a borrowing from or an assimilation towards RP, and might not then be expected to undergo a Scots-specific process like the SVLR. This suggestion, however, is only tentative: in view of the uncertainty in the sources reflected above, and in the absence of convincing experimental evidence, I shall concentrate in what follows on the monophthongs and the diphthong /ai/, and will not consider the other diphthongs further.

I shall now return to those short vowels which fail to undergo SVLR synchronically. Two such vowels were briefly considered in Chapter 4 (Section 4.10); here it was noted that early Middle English short high /i u/, which had laxed, lowered and partially centralised to /I ʌ/ by the time SVLR was introduced, never lengthened. The modern Scots/SSE descendants of ME short high /i u/ likewise fail to undergo the synchronic SVLR. In most modern Scots dialects, these will surface as consistently short [I ʌ]; however, the reflexes of earlier /i u/ may vary in quality cross-dialectally - hence Lass's assertion that:

"quantity is now in effect neutralised *in toto*, but not segmentally neutralised for two (synchronically arbitrary but historically principled) vowels" (1974, p.336).

The 'Aitken vowel' /ɛ̈/, which replaces /I/ in some varieties, is also consistently short.

We now come to the problem of /ɛ/, which has been considered both as a lengthenable and as a consistently short vowel. Lass (1974), Wells (1982), Aitken (1981) and Harris (1985) all agree that /I ʌ/ fail to lengthen. They also assume that /ɛ/ forms part of the set of input vowels for SVLR, but do not discuss it individually. However, this vowel merits individual consideration, since in fact there is little evidence for its classification as a lengthenable vowel.

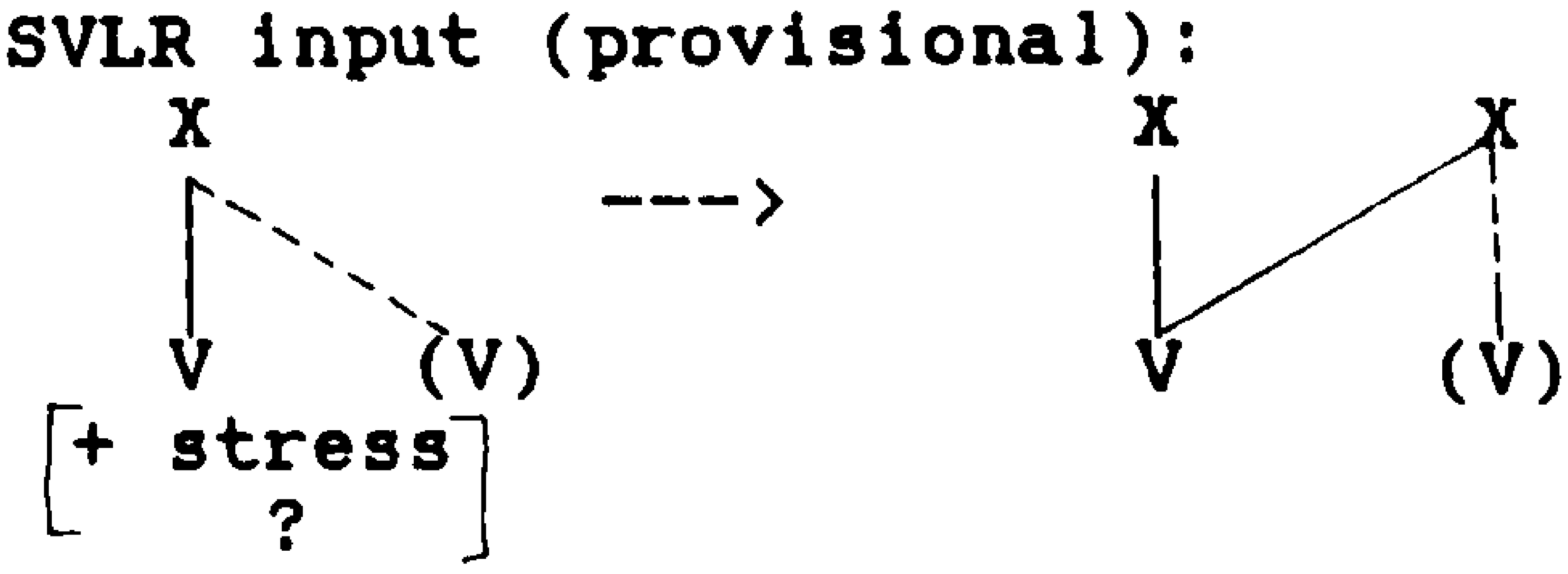
There are two possible sources of evidence for the classification of /ɛ/ as a lengthenable or non-lengthenable vowel; these are the recent experimental work reported by McClure (1977), Agutter (1988a, b) and McKenna (1987), and the more informal accounts in the earlier dialect descriptions by Watson, Zai and others. In this case, we shall have to rely predominantly on the latter, since the experimental evidence is inconclusive. Agutter did not test /ɛ/, and McClure and McKenna, who did, were unable to test /ɛ/ in as full a range of contexts as the other allegedly lengthening vowels. For instance, the absence of /ɛ/ from stressed open syllables means that no examples of this vowel word-finally or before inflectional [d] or [z] are available. /ɛ/ occurs relatively frequently before a consonant cluster with /r/ as the first element, as in *heard, herb* or *serve*, but SVLR is strongest before final /r/ (Aitken 1981), and perhaps operates only before final single consonants (although in the absence of conclusive experimental evidence, this must again remain a tentative and corrigible suggestion); and here /ɛ/ is rare. Some possible forms, like the pronoun *her*, are unreliable since they are characteristically unstressed and produced with reduced schwa, while in other cases where /ɛ/ might be expected, like *their* (with RP [ɛə]), neutralisation seems to be in operation, and [e] appears in Scots/SSE. McClure was forced to resort to using the name *Kerr* /kɛr/, despite the notorious unreliability of names as linguistic evidence. In any case, a sequence of /ɛ/ plus an /r/ with any degree of retroflexion would prove almost impossible to segment accurately, making any results obtained even more unreliable. Examples of /ɛ/ before a final voiced fricative are only marginally easier to find; McClure and McKenna both used the name *Des* /dɛz/ here, and one of the few alternatives is *rev* /rɛv/. However, McKenna (personal communication) reports that his subjects experienced some difficulty with this item, so that several of his data points were invalidated due to mispronunciations. The required contexts seem in some sense unnatural for /ɛ/.

Experimental evidence for the supposed lengthenable character of /ɛ/ is therefore based on fewer data points and fewer contexts than is the case for other vowels tested, when it is available at all. Nevertheless, McClure (1977) claims to have found results broadly in line with the length modification expected if SVLR did affect /ɛ/. However, even this is inconclusive, since we shall see in Section 2.3. below that McClure's experiment, which involved only one informant, is open to criticism, and that the results obtained may be unreliable.

The inconclusive nature of this experimental work means we must turn to the descriptions of /ɛ/ found in earlier dialect studies. Here, /ɛ/ is consistently classified as non-lengthening. For instance, Dieth (1932) specifies that /ɛ/, along with /I ʌ ɛ̈/, is universally short, as does Wettstein (1942). Grant (1912, §140) alone suggests that /ɛ/ may lengthen, but only under extremely limited circumstances, namely when it is used "in words spelled *air, ere*, etc., instead of the old e:." Thus, although more recent sources like Aitken (1981) and Lass (1974) tend to class /ɛ/ with the lengthenable vowels, there is little experimental data to support the hypothesis that /ɛ/ lengthens. However, it is clear that earlier dialect descriptions regarded /ɛ/ as not forming part of the input to SVLR. Since this latter descriptive evidence is the most conclusive presently available, I shall accept that /ɛ/, along with /I ʌ ɛ̈/, is an exception to SVLR. Our next task, then, is to ascertain whether these vowels constitute a natural class, and can therefore be excluded from the input to the rule.

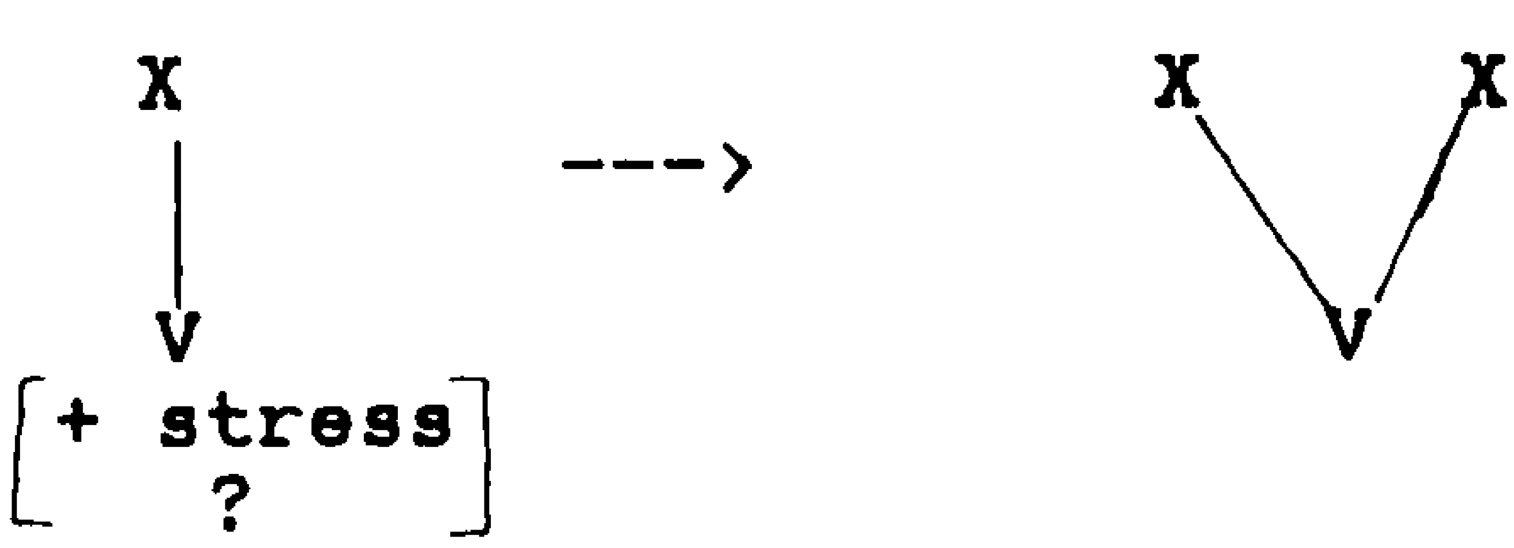
Let us assume initially that SVLR applies only to stressed, underlyingly short vowels - that is, vowels with only one timing slot (see (6)).

(6) SVLR input (provisional):



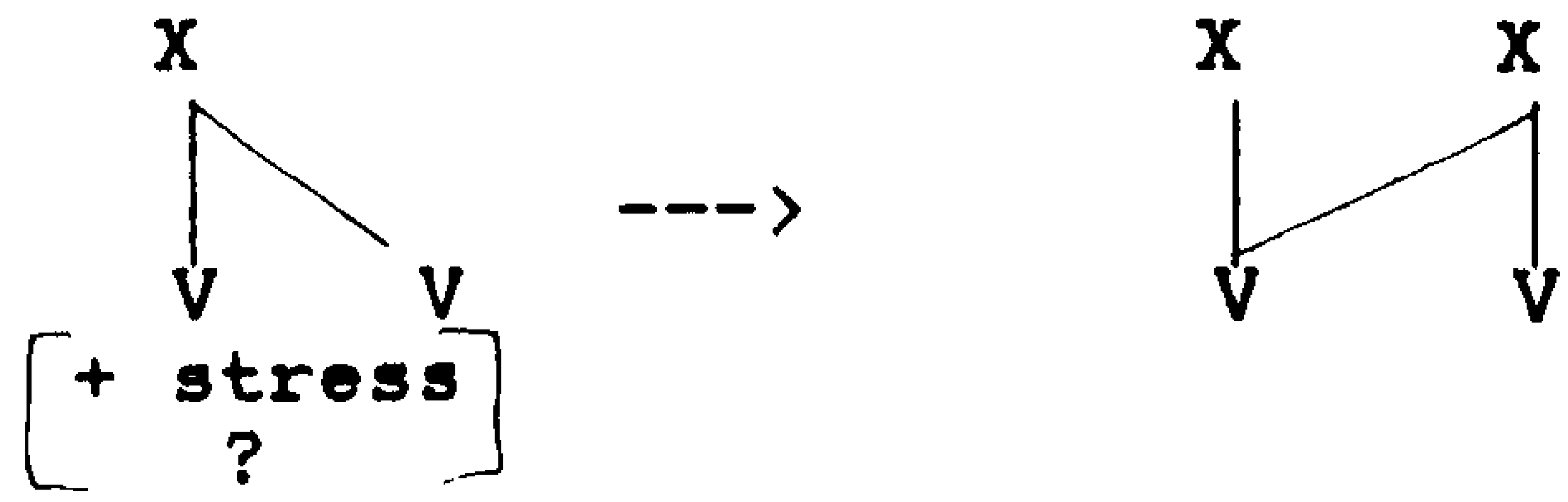
The dotted lines in (6) indicate the optional attachment of a second set of vowel features, while maintaining the same number of abstract timing slots; this permits the rule to cover short stressed diphthongs as well as short stressed monophthongs, as the individual subrules in (7) show.

(7)a.



= short monophthongs, e.g. /i u e o/

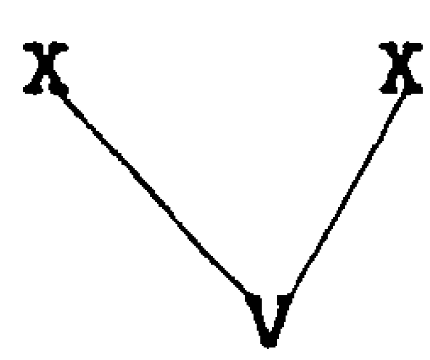
b.



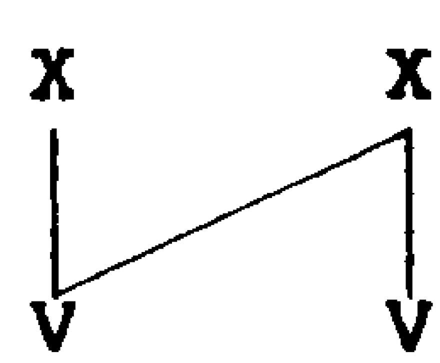
= short (falling) diphthongs,
e.g. /ai/, perhaps /ɔi/, /au/

Phonemically long monophthongs, such as /ø: a: ɔ:/ in at least some areas, will be excluded since they fail to display the required configuration of vowel features and timing slots. This may also account for the possible exceptionality of the diphthong /au/ in SSE where, as noted above, it is represented only by the adoption of RP pronunciations. /au/, then, might be designated a long diphthong, as it is certainly long in RP. Representations for long monophthongs and diphthongs are given in (8); it is clear that these do not match the input conditions for SVLR shown in (6), and that /ø: a: ɔ:/ (and perhaps /au/) will therefore be correctly excluded.

(8)



long monophthongs, e.g.
/ø: a: ɔ:/ in some dialects.



long (falling) diphthongs,
e.g. perhaps /au/.

However, we have not yet succeeded in distinguishing lengthenable /i u e o (a ɔ)/ from non-lengthening /I ʌ ɛ̈ ɛ/. All are underlyingly short, yet only the former set undergo SVLR. I propose to use the feature [± tense]; potential input vowels for SVLR will be classified as [+ tense], while non-lengthening /I ʌ ɛ ɛ̈/ will be [- tense].

This dichotomy can be substantiated by synchronic and diachronic evidence. Synchronically, it should be noted that the quality of Scots/SSE /I ʌ ɛ/ is comparable to that of the corresponding set of short, lax vowels in RP, while each Scots tense vowel corresponds to a long tense vowel (or, in the case of SSE /a ɔ u/, to an opposition involving a long tense vowel) in RP. There are also distributional grounds for the distinction, since [± tense] captures a natural class in Scots: for instance, tense vowels may characteristically occur in stressed open syllables, and indeed this holds for the [+ tense] Scots/SSE vowels - *bee, blue, bay, bow, law, baa* have final /i u e o a ɔ/. However, /I ʌ ɛ ɛ̈/ occur only in closed syllables, a restriction typical of lax vowels: so *bit, but, bet* are possible, but *[bI], *[bʌ], *[bɛ] are not.

Certainly, for behavioural and distributional reasons, /ɛ/ forms a natural class with /I ʌ ɛ̈/. This affinity of /ɛ/ with the other lax vowels is underlined by Dieth's (1932, p.2) reference to /I ʌ ɛ ɛ̈/ as "the phonetician's worry", on the grounds that they are all interchangeable and may be hard to distinguish by ear. In careful speech, or when the items carry prominent or contrastive stress, many Scots speakers differentiate words like *fir* [fIr], *fur* [fʌr] and *fern* [fɛrn]. However, in more casual registers or under low stress, /I/ and /ʌ/ will tend to fall together, and the entire set /I ʌ ɛ/ may also do so (see (9)).

(9)	fir	[I]	[ʌ]	
	fur	[ʌ]		[ɛ]
	fern	[ɛ]		

Perhaps the most conclusive arguments in favour of the use of [± tense] as a dichotomiser of lengthening and non-lengthening vowels in Scots/SSE are diachronic. We have already established (see Lieber 1979 and Chapter 4, 4.2.) that, to account for the apparent lowering of vowels affected by Middle English Open Syllable

Lengthening, we must assume that the feature [± tense] became relevant in the English vowel system at some time between the 10th Century (when Homorganic Lengthening operated, without lowering) and the 12th Century, when MEOSL applied. That is, while both long and short vowels were presumably redundantly tense in Old English, the implementation of a length-tenseness correlation meant that long vowels were tense and short vowels lax in Middle English. The operation of SVLR in Scots/SSE has disrupted this correlation, so that almost all vowels (and all in some varieties) are now underlyingly short. However, some are arguably synchronically tense, while others are lax, and this is not arbitrary, but reflects a historically motivated division. Those vowels which undergo SVLR in modern Scots/SSE are precisely those which had some tense sources in Middle English. /i u e o/ have only long/tense sources, namely post-Great Vowel Shift /i: u: e: o:/ respectively. The situation as regards the low vowels is much more complex and will be explored more fully in Section 3.2. below, but let us for the moment accept Lass's (1974) analysis. Lass suggests that short low lax /æ ɒ/ lengthened by historical SVLR while /a: ɔ:/ (which were marginal in Scots after the GVS) shortened, producing mergers: modern Scots/SSE /a ɔ/ consequently also have some tense sources. /I ʌ ɛ/, however, are descended only from lax vowels, and here again /ɛ/ allies itself with the lax set, since all possible long/tense sources for /ɛ/ were in fact collapsed with other vowels during the Great Vowel Shift. ME /ɛ:/ raised to /e:/ and subsequently, in some cases, to /i:/, and although /a:/ in turn raised to /ɛ:/, it afterwards continued to /e:/, leaving the long half-open front slot empty after the completion of the GVS. The only possible source for a lengthenable /ɛ/ in modern Scots would be Middle English short lax /ɛ/, which was unaffected by the GVS and might be considered a suitable input to the lengthening subrule of the historical SVLR.

However, it should again be noted that the other short vowels which purportedly underwent contextual lengthening, i.e. /æ/ and /ɒ/, had long counterparts in the system which simultaneously shortened in the appropriate contexts, allowing merger: /ɛ/ alone was isolated.

The use of [+ tense] in the structural description of SVLR will, then, effect the appropriate exclusions, and is clearly synchronically and diachronically motivated, insofar as the feature [± tense] itself is motivated. However, as Halle (1977, p.611) notes, "the feature of tenseness has had a long and complicated career in phonetics", and its employment here may consequently cause a little disquiet, in view of the objections which have been raised against its integrity and usefulness. My contention that Lexical Phonology can capture necessary and relevant generalisations without undue abstractness will hardly benefit from avowed support for a "pseudo-feature" (Lass 1976).

One of the most vocal detractors of [± tense] has been Lass (see especially Lass 1976), who bases his case for the abandonment of the feature largely on the difficulty of locating distinct, measurable phonetic correlates for it. Lass holds that:

> "most of these are based on the presumed 'effects' of tenseness. And all of these 'effects' are independent variables, parameters that require independent notation in any case, so that...attribution of these to 'tenseness' is a mere assertion" (Lass 1976, p.40).

Lass's position, then, is that, when two vowels differ with respect to a cluster of phonetic factors such as relative height, backness and degree of rounding, each factor should be considered separately rather than ascribed as a set to "an explanatory abstraction" (Lass 1976, p.49) like tenseness. This difficulty in defining [± tense] independently has been recognised by other phonologists who choose, however, to retain the feature.

For instance, Halle (1977, p.611) points out that tense vowels will tend to be longer, have greater tongue height, and be produced with a narrower vocal tract configuration than lax ones, and admits that "as a result of these multiple correlations, phoneticians have had difficulty keeping tenseness distinct from other phonetic features." And S. Anderson (1984, p.95), while again acknowledging the same problem, maintains that there is nonetheless a need for a feature of tenseness:

"...there is a considerable amount of disagreement in the phonetic literature concerning the precise definition of this distinction. There is rather less disagreement, however, on the proposition that there is indeed something to be defined."

In fact, it seems that Lass's arguments for the dismissal of [± tense] as a 'pseudo-feature' can be countered: I summarise five main objections below.

1. It is true that tenseness is intimately connected with tongue height, frontness/backness and degree of lip rounding, and that these can be individually described using independent features. However, the importance of these components for the tense-lax dichotomy lies not in their individual contributions, but in the conjunction of a number of factors; and the weighting of contributory features is not equivalent in distinguishing different tense-lax pairs. So, although tense vowels tend uniformly to be more peripheral than their lax counterparts, the interpretation of 'peripherality' is fluid. A high front tense vowel will thus be higher and fronter than its lax counterpart, while a low back rounded tense vowel expresses its peripherality vis-à-vis its lax partner by being lower, more back, and more rounded. It is this variable clustering of features, which would be difficult to relate using only the contributory elements, that [± tense] is intended to encapsulate.

2. The use of the tenseness feature in sound systems may make otherwise opaque natural processes explicable and characterisable (see again the account of MEOSL in Lieber 1979, and also Chapter 4, 4.2. above). This is surely one of the major tasks of linguistics and a primary requirement of the formal and theoretical tools it employs.
3. It is not necessarily true that, as Lass asserts, tenseness is definable only according to its effects (such as the presence of glides, in SPE terms), rather than "on the basis of a prior (historically based) partitioning of the lexicon" (Lass 1976, p.40). We have already seen that a "historically based" characterisation can readily be found for the four lax vowels /I ʌ ɛ ɛ̈/ in modern Scots/SSE, which form a historically motivated natural class as the only vowels in the inventory with no long (or tense) Middle English sources. These cannot be classified simply as short, since most, if not all Scots vowels are underlyingly short, but this group also fail to undergo SVLR.
4. Lass's idea of indicating the various ways in which 'tense' vowels differ from 'lax' ones individually, without subsuming these parameters under a unifying feature of tenseness, can be shown to be intrinsically unsatisfactory for some languages. For instance, although in many languages there is a length-tenseness correlation such that long vowels are tense and short ones lax, there are cases where both long and short vowels may be tense, as in Icelandic (and, on the surface, Scots/SSE). S. Anderson (1984, p.95-6) concludes from this that:

> "we clearly cannot simply reduce the parameter of tenseness to that of vowel gemination, since some languages (such as Icelandic) show independent manipulation of tenseness and length."

Furthermore, as Woods (1975, p.111) asserts, the association between length and tenseness may vary, not only cross-linguistically, but diachronically in one language. For instance, whereas in Middle English long vowels are consistently tense and vice versa, the advent of SVLR has altered this correlation for Scots/SSE, where tense vowels are now those which may become long, under certain phonetic circumstances (see Chapter 6 for further consideration of this diachronic development). Similarly, although a length-tenseness correlation obtains generally in RP and GenAm, recent work by Labov (1981) and Harris (1989) suggests that the æ-Tensing rule operative in varieties like Philadelphia, New York City and Belfast has led to underlying restructuring in some dialects, producing an underlying distinction of short lax /æ/ and short tense /Æ/ (see further Section 3.4. below).

5. [± tense] does, in fact, have verifiable phonetic correlates, as shown by Wood (1975). Although Wood agrees that "the terms tense and lax are notoriously ambiguous in both phonetics and phonology" (1975, p.110), and ascribes one source of this ambiguity to the difficulty of defining "the physiological and acoustical character of the contrasts" (p.110), he explicitly challenges the importance of this difficulty, on which Lass rests the bulk of his anti-tenseness case, claiming that:

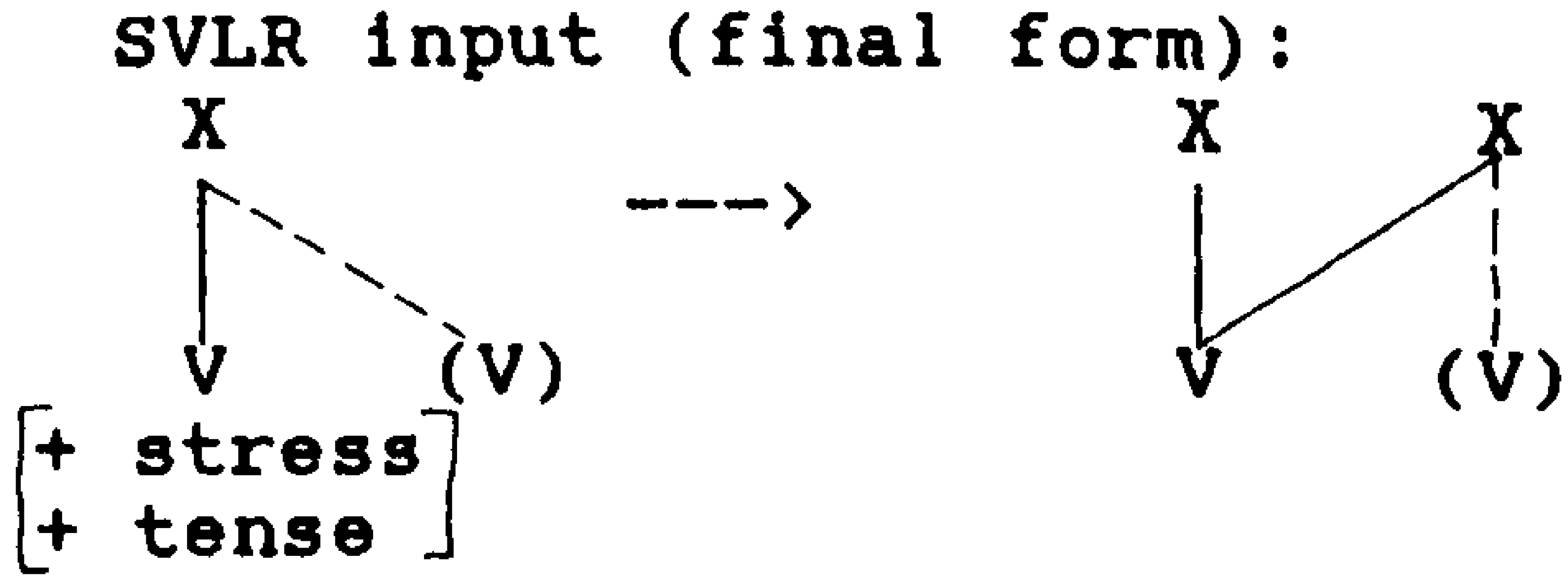
> "This ambiguity is not so serious, since it reflects our limited knowledge of the production processes involved. As our knowledge increases, this ambiguity will be resolved."

Indeed, Wood himself goes part-way towards defining a physiological basis for the proposed tense-lax contrast. Wood used X-ray tracings of vowel articulations to demonstrate that tense and lax vowels differ consistently with respect to degree of constriction and, less importantly, in pharyngeal volume. Furthermore, tense rounded vowels tended to show a greater degree of lip-rounding than the corresponding lax vowels. Wood worked on English, Egyptian Arabic, Southern Swedish and West Greenlandic Eskimo, and found that:

> "the articulatory gestures involved appear to be much the same irrespective of language, which points to a universal physiological and biological basis for the acoustical contrasts founded on [the tense-lax] difference" (1975, p.111).

It is true, then, that there are arguments against the feature [± tense]. However, I contend that there are more convincing arguments in favour of tenseness, and that its use in the analysis presented here is justified. SVLR may now be formulated with its input conditions complete - the question mark of (6) is replaced by the specification [+ tense], as in (10).

(10) SVLR input (final form):



2.3. The Experimental Evidence

If there are few adequate formulations of SVLR in the literature, even fewer experimental investigations are reported, with the result that most discussions of the process are informal, conjectural and anecdotal, relying on intuition and personal perceptual judgement on the part of the investigator. McClure (1977) does present instrumental measurements of the durations of eleven vowels in Scots monosyllables, spoken both in isolation and in an invariant frame sentence, which appear to confirm the operation of SVLR, but the weakness of his experimental design makes his results extremely unreliable. Only one informant, McClure himself, was involved, so that data from only one dialect was available, and only two repetitions of each vowel in each context were recorded. In addition, McClure's average vowel duration and range of vowel durations were considerably higher than those of any speaker involved in Agutter's experiment (Agutter 1988a, b; to be discussed below). It is at least possible that McClure's results reflect "an exaggerated differentiation of vowel length in long and non-long contexts and extreme carefulness in the part of an informant who knew the purpose of the experiment" (Agutter 1988b, p.15).

The only other systematic experimental study to have been conducted on the supposed effects of SVLR is reported in two papers (Agutter 1988a, b) which embody an attack on the unity of SVLR and its restriction to Scots dialects and SSE. I shall briefly outline Agutter's investigation below, before proposing an alternative analysis of her data which corroborates the existence of SVLR as a productive but Scots-specific process.

Agutter obtained data from two male and two female SSE speakers, all middle-class and from Edinburgh, and from two RP speakers, one male and one female, each from a different part of the UK. All were university students aged between 18 and 23. Each informant, recorded individually, produced a number of English monosyllables in an invariant frame sentence "I say WORD sometimes". The monosyllables contained the five vowels under investigation in varying contexts, some of which are designated as SVLR lengthening environments, the remainder being short contexts (see (11)).

(11)
SVLR long contexts: -+, -+d, -r, -v, -z, -ð
SVLR short contexts: -t, -d, -n, -p, -b, -s, -f

The vowels tested were /ai i au/, which Agutter assumes should undergo SVLR if there is such a process (although /au/ is frequently regarded as exceptional, see 2.2. above), /ɔ/, which Aitken (1981) states is consistently long and therefore exceptional with respect to SVLR, and /I/, which is consistently short and therefore also an exception.

Spectrograms of the monosyllables were produced, and the relevant vowel durations calculated from these, by hand, to the nearest centisecond. Weighted average values for each vowel for all speakers of each accent and for each context were then calculated, by multiplying average lengths per vowel per informant by the ratio 13.0/A, where 13.0 is an arbitrary average vowel length and A is the overall average vowel length for that informant. This weighting process is intended to allow a more meaningful comparison of the two accent groups by reducing the potentially distorting effect of idiolectal variation. The various contexts were also rank-ordered from longest to shortest for the combined speakers in each accent group. More details of these analysis procedures can be found in Agutter (1988b, pp.9-10).

Agutter's experimental design is open to criticism on several counts. First, the small sample size is likely to place undue emphasis on individual variation, perhaps allowing idiosyncrasies to be wrongly interpreted as generalisations. Artefacts of the particular experiment might also go unrecognised. It is true that Agutter introduced her weighting technique to reduce the contribution of such perturbations. However, Agutter's weighting procedure, although a standard approach, may not be entirely valid for her results, since the technique used involves an assumption that any variation found will be normally distributed. Given that SVLR, as an accent-specific process affecting only certain vowels in certain contexts, would contravene this expectation and produce a skewed distribution, weighting might in fact mask exactly the variation Agutter is testing for.

It is also unclear how representative the informants were of their respective populations, phonologically as well as statistically. SSE, rather than Scots dialect speakers were used; these were middle-class university students and might be expected to assimilate to RP and lose or de-emphasise their Scots features. However, Agutter does not tell us whether her SSE informants had other non-Scots characteristics; how many, for instance, had 'imported' the southern /æ/ - /ɑ/, /ɒ/ - /ɔ/ and /ʊ/ - /u/ oppositions? Furthermore, the distribution of informants across accent groups is unbalanced, since four SSE speakers but only two RP speakers were involved. This lack of balance makes further statistical testing difficult.

There are further difficulties with Agutter's use of actually occurring English words, since certain contexts were unavailable for investigation due to accidental gaps in the English lexis; no monosyllables were found for /ɔ/ before /r ð s f/, /au/ before /v b p f/ or /i/ before /b/. Some of the words used in the experiment, such as *mouthe, gawp* and *dowd*, are also relatively unfamiliar, and might have caused the informants to produce uncharacteristic pronunciations, and indeed there are a number of gaps in the data, resulting from unusable tokens produced by individual speakers. The use of nonsense syllables would have solved the first problem, but whether it would have alleviated or exacerbated the second is debatable.

Despite these objections, Agutter's study is still more likely to produce reliable data than simple perceptual observation, since experimental measuring techniques were employed.

Agutter's results are, in her opinion, inconsistent with a formulation of SVLR as Scots-specific, since they suggest that lengthening of vowels takes place in SSE and

RP, both in the SVLR long environments and before other voiced consonants:

"all the contexts which SVLR states to be long are indeed long contexts for Scots; however, the expected accent differences are not confirmed, either in long or non-long contexts. In particular, there is no evidence from the present study that /-b/ and /-n/ are long contexts for RP but not for SSE" (Agutter 1988b, p.11).

Furthermore,

"the two vowels investigated that are claimed to be excluded from SVLR, /I/ and /ɔ/, showed the same pattern of context-dependence of length as did the three vowels to which SVLR is said to apply" (Agutter 1988a, p.129).

That is, all the vowels tested, for speakers of both accent groups, appeared to lengthen before all voiced consonants, although slightly greater duration was consistently apparent in SVLR long environments: "phonetic contexts fall into three, not two, phenomenologically distinct classes in terms of vowel length" (Agutter 1988a, p.129).

From these findings, Agutter concludes that firstly, "SVLR is too restrictive in the set of contexts which it designates as long contexts in Scots" (1988b, p.16). Secondly, she believes that:

"the results of this investigation can be accounted for in either of two ways: (1) The RP informants used in this study have acquired vowel length patterns as a result of contact with SSE and Scots speakers. (2) The SVLR claim that context-dependence of vowel length is Scots-specific is mistaken" (Agutter 1988b, p.19).

The former solution can be disregarded since, as Agutter notes, the RP speakers concerned had lived in Scotland for only a short time, and also preserved other diagnostic features of RP, such as an opposition of the front and back low vowels, /æ/ and /ɑ/, diphthongisation of long mid vowels, and non-rhoticism. She consequently prefers the latter explanation, and claims that "the context-dependent vowel length encapsulated in SVLR is not and perhaps never was Scots-specific" (Agutter 1988b, p.20).

Agutter considers that a single process is responsible for all the vowel length variation shown in the results of her experiment; if this process is to be equated with SVLR, then the contexts in which it operates must be generalised to include voiced consonants other than fricatives and /r/, and it must also affect RP. However, my contention is that a more enlightening account of the data can be given if we assume that two overlapping processes are at work: one, SVLR, is a phonological rule peculiar to Scots and SSE, while the other is a pan-dialectal and perhaps universal low-level phonetic lengthening rule which operates before all voiced consonants.

2.4. An Alternative Analysis

There seems to be a consensus of opinion among phoneticians that a vowel lengthening hierarchy operates, certainly in all English dialects and perhaps universally, whereby all vowels will be shortest before voiceless stops and longest pre-pausally, as shown in (12) (House and Fairbanks 1953, Peterson and Lehiste 1960, House 1961, Delattre 1962, Chen 1970).

```
(12)
   voiceless                           voiced
 stops     fricatives   stops/nasals   fricatives   #
  V shortest -----------------------------> V longest
```

Measurements illustrating these differences in length in American English are given in (13). Preceding consonants appear to have a negligible effect on the duration of following vowels (Peterson and Lehiste 1960).

(13)

Duration of syllable nuclei as a function of the following consonant, for American English (from Peterson and Lehiste 1960). Durations are in centiseconds. Short vowels are [I ɛ ʊ ə]; long vowels are [i æ ɑ ɔ u eI oʊ aʊ aI ɔI].

Consonant	Short vowels	Long vowels
-p	13.8	18.8
-t	14.7	21.0
-k	14.5	20.0
-tʃ	14.5	19.8
-f	19.2	26.1
-θ	20.8	26.5
-s	19.9	26.9
-ʃ	21.2	27.8
-m	22.0	31.3
-n	21.6	32.2
-ŋ	21.8	35.0
-b	20.3	30.7
-d	20.6	31.8
-g	24.3	31.4
-dʒ	19.1	30.0
-l	21.8	29.3
-r	22.6	29.3
-v	23.1	37.4
-ð	26.0	38.1
-z	26.2	29.0
-ʒ	----	41.0

Various explanations for the variable lengthening effect of following consonants have been suggested, the most commonly accepted being an interaction of the lengthening caused by voicing with "the different speeds of the transition from vowel to consonant closure" (Chen 1970, p.152). Voicing of a following consonant certainly seems to have the greatest impact on vowel duration; Peterson and Lehiste (1960) report that vowels recorded from their American English-speaking informants were characteristically longer before voiced consonants than before voiceless consonants in otherwise identical environments by a ratio of approximately 3:2. This may be due to the operation of a type of compensatory lengthening: if roughly the same time is allotted to each VC sequence in an utterance, and voiceless consonants are longer than voiced, vowels before voiced consonants may lengthen to maintain a quasi-constant duration for the VC sequence.

Whatever the physiological or articulatory motivation for this lengthening process, the measurements displayed in (13) show its effects clearly, and in the references cited above its operation is asserted to be universal (although the magnitude of the lengthening may depend on the phonological structure of the language concerned - Zimmerman and Sapon 1958). I shall call this lengthening process, which is dependent on the 'voicing effect', Low Level Lengthening (LLL), and will argue in Chapter 6 below that it must be characterised as an automatic phonetic, or postlexical operation, while SVLR is a lexical phonological rule in Scots and SSE.

If the suggestion that two interacting processes operate in Scots/SSE, but only one in non-Scots dialects of English, is correct, one would expect a number of predictions to be borne out by instrumental measurements such as those from Agutter's study.

1. The same degree of lengthening should be apparent in RP and Scots/SSE for all vowels in environments which are long for LLL but short for SVLR, that is before voiced stops, nasals and /l/.
2. A rather greater increase in length should be found for all RP vowels before voiced fricatives and /r/ and pre-pausally, in accordance with the pan-dialectal scale of lengthening contexts cited in (12), and the degree of lengthening in these environments should be comparable for those Scots vowels which are exceptions to SVLR.
3. For those Scots/SSE vowels which are subject to SVLR, in SVLR long contexts, an extra increase in duration due to the operation of both SVLR and LLL would be expected.

In fact, Agutter's data can be shown to be consistent with these predictions, and thus with the hypothesis that two distinct rules are operating in Scots/SSE.

If complex statistical tests are to be applied to a set of data, these should ideally be decided on prior to the execution of the experiment and their assumptions incorporated in the experimental design. However, I am only examining Agutter's data after collection, and a number of possible tests prove unsuitable. Furthermore, as noted above, the data lack balance and contain a number of gaps, and hence do not merit complex statistical treatment. Consequently, I have employed very simple numerical analyses in my treatment of Agutter's data; these are robust and should at least give a general indication of any trends in the results.

I considered the behaviour of the vowels tested by Agutter for her two accent groups, in three sets of contexts, which I labelled short, long and SVLR environments (see (14)).

(14)
Short = following /f s t p/
Long = following /b d n/
SVLR = following /v ð z r +d #/

The vowels were not all considered individually; /ai/ and /i/ were grouped together, as the two vowels which are generally agreed to be subject to SVLR, and /ɔ/ and /I/ were combined, since both are generally classed as exceptions to SVLR. As for /au/, Agutter placed this diphthong in the SVLR class, but as seen in Section 2.2., it is more frequently treated as exceptional: I therefore kept /au/ separate, to ascertain which pattern it might be following. The combination of long /ɔ/ and short /I/ for RP might be challenged, but this class difference should be irrelevant to the investigation in hand, since we are concerned with patterns of lengthening, not absolute values. Furthermore, grouping together as many vowels as possible is advantageous in that it helps compensate for the small sample size by spreading and de-emphasising the effects of individual variation, as well as making the results easier to assimilate.

The values in (15) represent the mean durations, in centiseconds, for the three groups of vowels /ai i/ (/aI i/ in RP), /au/ (RP /aʊ/) and /ɔ I/, in each set of contexts (see (14)) and for each accent group. These were calculated from Agutter's measurements per vowel per speaker per context (Agutter 1988a, Table 2). To illustrate the method used, let us consider /aI i/ in short contexts in RP. Here, two vowels and two speakers are involved, and there are four short contexts, /-f, -s, -p, -t/, giving a total of 16 values. These values were summed and divided by 16 to give the mean value of 12.9 csec. listed in (15). For the equivalent vowels in the same contexts in SSE, 32 values were summed, since there are twice as many speakers in the SSE group, and the average duration of 11.8 csec. found in (15) results from the division of the sum of all 32 values by 32. For /ai i/ - /aI i/ in short contexts, the data set is complete; that is, there are no gaps due to mispronunciations or non-existence of lexical items. When such gaps occurred in Agutter's data (for instance, measurements of /au/ before /-ð/ are missing for two SSE speakers, and no value for /ɔ/ before /-v/ is given for one RP informant), I excluded the context(s) with incomplete data for the subset of vowels concerned and for both accent groups. Thus, since there are missing values for /I/ before /-f/ for two SSE speakers, /-f/ is excluded from the set of short contexts for /I/ and /ɔ/, with which it is combined, for RP as well as SSE.

Standard errors were also calculated for each mean value, and are listed in brackets in (15).

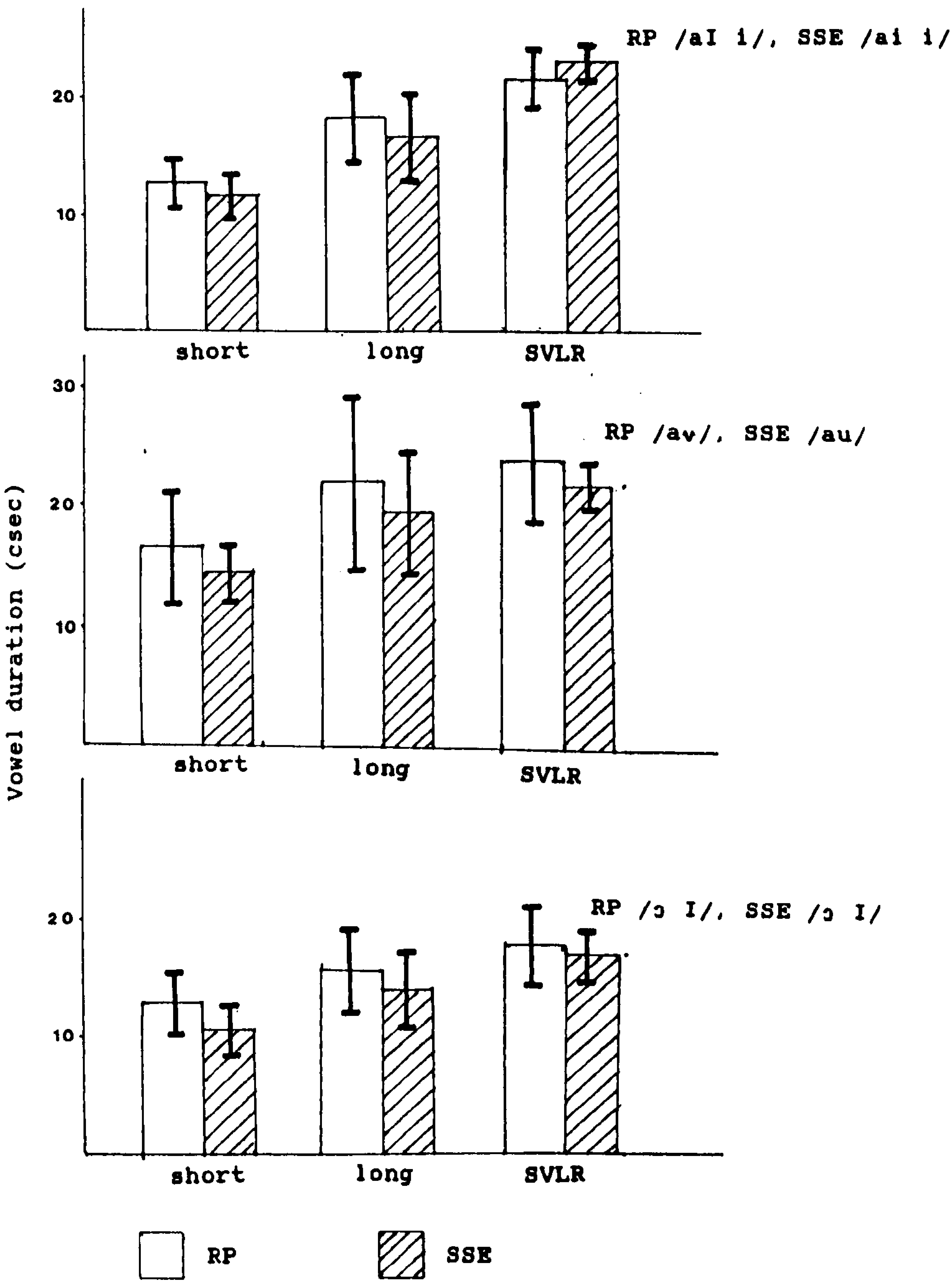
(15)

		short	long	SVLR
	/aI i/	12.9 (0.725)	18.3 (1.43)	21.6 (1.9)
RP	/aʊ/	16.5 (1.5)	22.0 (2.4)	25.3 (1.1)
	/ɔ I/	13.1 (0.97)	15.5 (1.6)	17.7 (1.45)
	/ai i/	11.8 (0.65)	16.6 (1.55)	23.0 (0.79)
SSE	/au/	14.9 (0.86)	19.5 (2.12)	21.2 (1.06)
	/ɔ I/	10.4 (1.01)	14.2 (1.35)	16.6 (1.13)

The values in (15) are graphed in (16), with error bars delimiting 95% confidence intervals: these indicate that there is a probability of 95% that the true population mean lies within this range.

(16)

Histogram of average vowel lengths for a sample of RP and SSE speakers, in short, long and SVLR contexts. An account of the vowels, contexts and speakers involved is given in the text. (Data from Agutter 1988a, b).



Due to the limitations of Agutter's experiment mentioned above, it is hard to draw statistically significant conclusions using her data. For instance, the small sample size produces large confidence intervals, even when vowels are combined. However, a trend is clearly discern ble from (16): RP vowels are universally longer than those of SSE speakers, except for the SVLR vowels /ai i/ in SVLR contexts, where this relationship is reversed. This trend is confirmed by a second set of calculations, again based on Agutter's data. Although, for reasons given above, I have chosen not to weight these results, the figures in (17) do represent a certain amount of standardisation. Here, the mean duration of each vowel group in short contexts is taken as the base, or 100%, since no environmentally conditioned lengthening process is assumed to be operating here. Vowel duration in long and SVLR environments is then expressed as a proportion of length in the short contexts. This assumption of a common base enables a comparison of like with like.

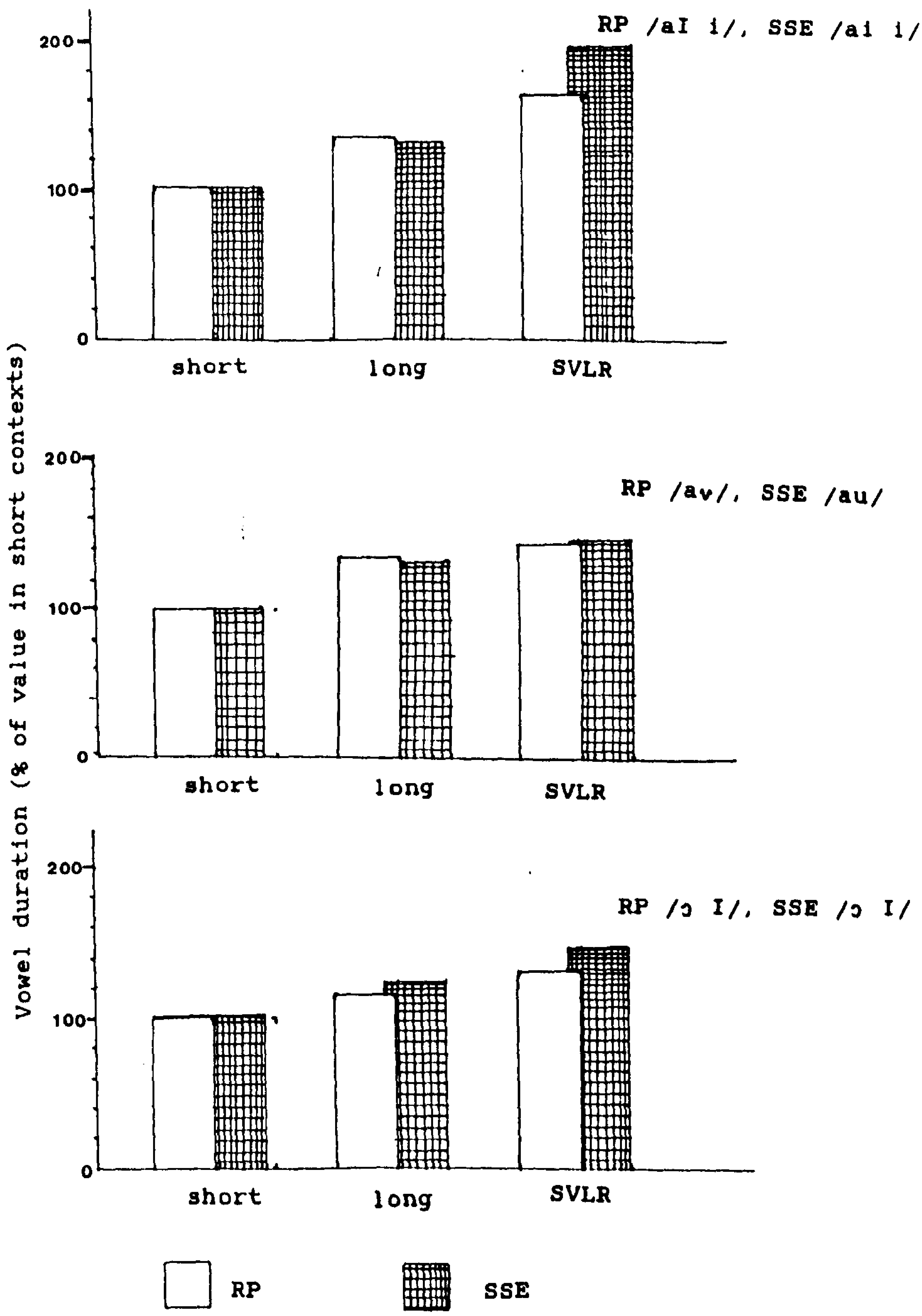
Although (15) and (16) make it clear that /au/ is behaving like /ɔ I/ rather than forming a class with the SVLR vowels /ai/ and /i/ in SSE, I have not combined the values for /au/ with those for /ɔ I/, since these three vowels all exhibit gaps in the data in different contexts, and my policy on such gaps would involve unacceptably reducing the number of data points for a combined class including /ɔ I au/.

(17)

		Short	Long	SVLR
	/aI i/	100%	141.9%	168.9%
RP	/aʋ/	100%	133.3%	153.3%
	/ɔ I/	100%	118.3%	134.8%
	/ai i/	100%	141.7%	196.6%
SSE	/au/	100%	131.1%	142.9%
	/ɔ I/	100%	136.5%	159.6%

(18)

Vowel length recalculated as a percentage of duration in short contexts, from data in (17).



It is clear from the percentage figures in (17), and the histogram derived from these in (18), that all vowels in RP and all SSE vowels apart from /ai i/ in SVLR environments, follow an equivalent pattern of lengthening, with 30-40% extra duration in long environments and a further 10-25% in the universally longer SVLR environments, i.e. before /r/ or a voiced fricative, and word-finally. However, for only those vowels which are traditionally classed as subject to SVLR, and in precisely those environments which are long for SVLR, a far greater degree of lengthening can be observed in SSE. /ai i/ lengthen by around 40% over short contexts in long environments in RP and SSE. If one process is responsible for all durational variation shown in (17), SSE /ai i/ should then show approximately 50-65% extra duration in SVLR contexts over short ones, in line with the behaviour of other vowels in SSE and all vowels in RP (with the exception of /ɔ I/, to which we shall return below). However, the actual increase for /ai i/ is 96.6%, 27.7% greater than the percentage increase for the equivalent set of vowels in RP.

My assertion that this extra duration is due to the operation of SVLR might be challenged in view of the fact that /ɔ I/, the supposed exceptions to SVLR, lengthen by 59.6% in SVLR over short contexts in SSE, but by only 34.8% in RP, with a similar extra increase for SSE of 24.8%. However, as the histogram in (18) makes clear, this discrepancy is due to the failure of RP /ɔ I/ to lengthen by the expected amount in long contexts, while SSE /ɔ I/ do follow the general pattern here. In both cases the difference between long and SVLR contexts is approximately 20%. Thus, the apparent extra lengthening for SSE /ɔ I/ is actually due to differences in the behaviour of the relevant vowels in long rather than in SVLR environments, and is probably an artefact of the experiment caused by the small number of informants in the RP class.

Around 25-30% of the durational change for /ai i/ alone, in SSE and in SVLR long environments, cannot be accounted for given Agutter's contention that one rule applying in both RP and SSE can explain all the attested length variation in both varieties. On the other hand, these results are of exactly the type predicted if two processes, operating in partially overlapping environments, are involved; one, common to both accents studied, produces the shared lengthening seen in (15)-(18), while the other, SVLR, accounts for the peculiarly Scottish additional lengthening which affects /ai i/ (and also /u e o/ and perhaps /a ɔi/, although these were not tested by Agutter) in the traditional SVLR environments.

We have now established that neither Low-Level Lengthening nor SVLR alone is sufficient to account for the lengthening behaviour of vowels in Scots/SSE, and that both rules must be assumed to operate in these varieties. Certain problems of verification do arise from explaining a single set of facts using two independent variables (here, LLL and SVLR). However, we can reason that, if LLL is universal or at least pan-dialectal for English, we should also assume its existence in Scots and SSE. Given that LLL alone cannot account for all the observable data in these varieties, we must then posit a second process.

In Chapter 6, we shall return to the diachronic domain to consider the origin of SVLR and the historical relationship of the two lengthening rules proposed above. The environment of synchronic SVLR will also be more adequately formulated, and the ordering of SVLR and LLL in a synchronic Lexical Phonology will be established.

This material will relate substantially to our initial Question 3, from Chapter 1, on the relationship of diachronic sound changes and synchronic phonological rules. However, we have as yet made very little progress on Question 2, on the possibility and extent of underlying variation between related dialects; yet this question provided the motivation for introducing SSE. I shall therefore conclude this Chapter by considering possible underlying discrepancies between SSE and our other reference accents.

3. Dialect Variation at the Underlying Level

3.1. Inter-Dialectal Communication

From the limited evidence presented in Chapters 2 and 3 above for RP and GenAm, and the rather more persuasive material on SSE versus these other varieties to be considered below, it seems clear that a constrained model of Lexical Phonology of the sort assumed here will be unable to generate all surface differences between related dialects from a common underlying inventory and set of representations. In terms of the abstractness of the synchronic system proposed for individual varieties, this has obvious advantages. However, before accepting this conclusion unconditionally, we should briefly consider some external evidence.

The area of interest here is inter-dialectal communication, and there are two subcases: first, comprehension of dialects X and Y by a speaker of a related dialect Z; and second, the adaptions a speaker of some non-standard variety may make to her output by way of accommodation to a target standard. In Standard Generative Phonology, the assumption of underlying structural identity for all varieties of a given language automatically accounted for the possibility of comprehension between speakers of varieties of the same language. Furthermore, adaptive accommodations of non-standard towards standard speech simply involve manipulations of low-level rules. For instance, speakers of a non-standard dialect may invoke 'footstep-following' (the adoption of a rule from the target standard variety) or 'step-retracing' (the loss or suppression of a rule usually implemented in the non-standard dialect but not in the target) (Harris 1985, p.341ff.). If the assumption of underlying unity is essential to allow for cross-dialectal communication and adaptive change, then a Lexical Phonology which cannot incorporate common underlying forms and derive all necessary surface differences by rule must, after all, be inadequate.

However, Harris (1985) argues that underlying identity is not a prerequisite for successful inter-dialectal communication. Harris notes that communicative breakdowns do occur among speakers of different, but related varieties, although the SGP assumption of common underlying forms should presumably rule out this possibility (1985, p.343); in addition, varieties of English may differ to an extent irreconcilable with inclusion in a common underlying system. And if underlying structural differences must be recognised, then clearly adaptive changes cannot be analysed as simply manipulations of phonological rules.

Harris concludes that "in general it is fair to say that cross-dialectal understanding succeeds in spite of structural differences rather than because of complete structural identity" (1985, p.346). Comprehension of related varieties may then be accounted for by proposing that speakers will, when necessary, invoke ad hoc, idiosyncratic comprehension or 'pattern-matching' strategies. As for adaptive change, Harris argues that:

> "it is often more appropriate to view adaptation to external pronunciation norms as involving shifts in the selection of alternative lexical representations rather than the manipulation of synchronic process rules" (1985, p.341).

In other words, altering output to conform to some target standard variety involves lexeme-by-lexeme phonemic redistribution; initially, one variant will be produced when using the native dialect, and another when speaking the standard. Any underlying restructuring will follow later, if at all.

The preceding discussion should have made it clear that it is possible, and indeed preferable, to account for inter-dialectal communication without relating all dialects of a language to some underlyingly unified system. A constrained Lexical Phonology incapable of generating surface variation from such a common system is therefore not invalidated by the communicational ability of speakers of different varieties.

I now turn to some underlying differences between Scots/SSE and RP/GenAm. First, there are various systemic and distributional discrepancies. For instance, Scots/SSE have /x/ and /ʍ/, which have been lost in many other varieties of English and which played no part in the synchronic account of RP/GenAm developed in Chapters 2 and 3 above. In the vowel system, Scots varieties lack /ʊ/, /æ/ and /ɒ/, while /ø/ and /ɛ̈/ are peculiar to Scots (with /ø/ perhaps occurring in some non-standard Northern English dialects). A number of further differences result from changes in the vowel system before historical /r/ in RP; for example, in RP *first, word* and *heard* have /3/ (another vowel lacking in Scots/SSE), while in Scottish varieties these have /Ir/, /ʌr/ and /ɛr/ respectively. These discrepancies have already been discussed in Chapter 4 and Section 2.1. above, and are also relatively minor, in that they have few, if any, consequences for the rest of the phonology. I shall therefore concentrate on two potentially more far-reaching cases of underlying variation, involving the low vowels and the choice of [± tense] or length as the dichotomising feature for the underlying vowel system.

3.2. The Low Vowels

I have elected to consider the low vowels of Scots/SSE for two reasons. First, the establishment of appropriate low vowel subsystems for RP and GenAm revealed the few underlying discrepancies between these two reference accents, and discussion of the *father* vowel suggested that variation in this area of the vowel system may be fairly common among varieties of English. Second, the surface facts of Scots/SSE indicate a fairly far-reaching distinction between these varieties and RP/GenAm.

The inventory of surface vowels for SSE given in (1) above incorporates the most usual assumption about the appropriate set of low vowels for Scots (see for instance Abercrombie 1979, Wells 1982): SSE is said to have only one low rounded and one low unrounded vowel, each representing a lax-tense opposition found in RP (see (19)). The discussion of the *father* vowel in Chapter 2, 3.4.1. suggests that /a/ will be front in Scots/SSE; /ɔ/ is back.

(19)

	SSE	RP
bat	a	æ
balm		ɑ̄
bomb	ɔ	ɒ
bought		ɔ̄

However, this is an oversimplification. If we accept the separation of the traditional Vowel Shift Rule into $\bar{V}$SR and $\breve{V}$SR, as advocated in Chapter 3 above, and examine the operation of these rules in SSE, it is clear that there is synchronic support for both lax and tense low vowels.

Before considering this evidence, I must confirm that the formulations of $\bar{V}$SR and $\breve{V}$SR from Chapter 3 are appropriate for SSE, since the operation of the Great Vowel Shift in Scots and other Northern dialects was different from its operation in the South (see Chapter 4, 4.8.). The major North-South discrepancy concerns the shifting of /u:/ > /au/ in the South, but its failure to shift in the North, perhaps because earlier /o:/ had fronted to /ø:/ in northern areas and therefore failed to raise to /u:/. However, this difference in application did not affect the low vowels, and has in any case been evened out in SSE, where, as noted earlier, pronunciations of *house, out* and so on with [ʌu] have now become the norm, displacing native Scots [u]. It seems, then, that we are justified in assuming broadly similar formulations of V̄SR and V̆SR for RP and SSE, and even for Scots dialects as far as the low vowels are concerned.

V̄SR and V̆SR both indicate that lax low vowels must be posited for Scots/SSE. For instance, the stressed vowel of *Caucasian* (compare *Caucasus*) can be assumed to have been tensed by CiV Tensing, and subsequently shifted by V̄SR to [e]. Reversing the derivation gives the underlying source vowel /æ/, which must be low and lax. /æ/, then, must also appear underlyingly in *Caucasus* and *Italy*, where it is reduced under low stress, and will furthermore be the underlying and surface vowel of *Italian*, which is an exception to CiV Tensing (and thus does not undergo V̄SR). On the other hand, the stressed vowel of *jocular* (compare underived *joke*) is derived from underlying /o/ by Trisyllabic Laxing and V̆SR, giving final lax [ɒ]. The same reasoning suggests lax surface [æ] in *sanity*; there is certainly no motivation for re-tensing in either case. Thus, the operation of V̄SR and V̆SR in SSE indicate that short lax rounded /ɒ/ and unrounded /æ/ must form part of the underlying vowel inventory, and also appear on the surface.

We might suggest, then, that ALL low vowels in Scots/SSE be classified as lax. However, the word-final vowels in *Shah, bra, baa* (and Scots dialect *twa* 'two'), and *gnaw, saw, law* (and Scots dialect *craw* 'crow' and *snaw* 'snow') must be tense due to the already-mentioned English phonotactic constraint that permits only tense/long vowels in open stressed syllables. We cannot propose underlying lax vowels and a final tensing rule since this would violate the phonotactics. In any case, "there is no evidence that vowels in open syllables were ever laxed" (SPE, p.261); the lack of historical evidence makes it impossible for me, in good conscience and bearing in mind the restrictions on Lexical Phonology assumed here, to avoid this problem by assuming only /æ ɒ/ and word-final tensing.

It is at this point that the problem of the low vowels becomes relevant to SVLR. The usual assumption that modern Scots has only two low vowels accords with Lass's (1974) account of the historical SVLR. Lass argues that Middle English /æ ɒ/ lengthened in SVLR long contexts and remained short elsewhere, while /a: ɔ:/ remained long in SVLR long contexts and shortened elsewhere, effecting a merger which is reflected in the presence of only two Scots/SSE low vowels, /a/ and /ɔ/, synchronically. If Lass's account of the origin of SVLR is correct, earlier /æ/ and /ɑ/, and similarly /ɒ/ and /ɔ/, should have merged as [+ tense] /a ɔ/, and all reflexes of these ME vowels in modern Scots/SSE should likewise be tense.

Tense and lax vowels are generally included in the vowel inventories of studies of Scots dialects (Dieth 1932, Watson 1923, and others), and the operation of VSR and the phonotactics of modern English also provide evidence of the independent existence of /æ ɒ/ and /a ɔ/. However, we must also account for the fact that Scots /a ɔ/ are often said to be consistently long and hence exceptional to SVLR (Aitken 1981, Agutter 1988a, b), and that, in some dialects, earlier /æ/ and /a:/ appear to merge as long in SVLR long environments - so Dieth (1932) lists [fɑ:r] as *faur* 'where' with earlier /a:/ and *far* 'far' with earlier /æ/. The situation seems hopelessly entangled.

It will be recalled that, at the time of the completion of the Great Vowel Shift, long /a:/ and /ɔ:/ had become extremely marginal in Scots. The sources of these vowels are catalogued in Chapter 4, and are summarised in (20).

(20)

Scots dialects after GVS: /a:/ or /ɔ:/ in:
a) chalk, salt, all... (< /al/)
b) laud, cause. law, saw, low, snow, old, cold... (< /au/)
c) twa, awa, water, father... (< labial C plus /a:/ > /a:/, or /ɔ:/, or /e:/ by GVS
(after Aitken 1977)

Not all of these contain SVLR long environments. Conversely, short lax /æ ɒ/ are the historically appropriate vowels in some items with SVLR long contexts (see (21)).

(21)

/æ/ - far, mar, vase
(Aitken 1981)

I propose that there was at least a partial merger of /æ/ with /a:/ and /ɒ/ with /ɔ:/ on the introduction of SVLR. /a:/ and /ɔ:/ would be reinterpreted as short outside SVLR long environments, and would merge there with earlier /æ/ and /ɒ/ as lax, non-lengthening vowels. This accords with the fact that modern Scots/SSE low vowels in short contexts are pronounced like the RP lax low vowels rather than the tense ones. In SVLR long contexts, /æ/ and /ɒ/ may have lengthened and merged with tense /a/ and /ɔ/. I shall consider these historical developments more closely in Chapter 6.

There is one obvious question here. Why should the lax and tense low vowels have merged as lax in SVLR short environments, but as tense in SVLR long contexts? It would perhaps be more reasonable to assume that only lax vowels resulted. In some dialects, these would lengthen exceptionally by SVLR; it is true that the tenseness/length correlation has never been so conclusive for low vowels (see Halle's (1977) account of American English, which assumes long lax and long tense low vowels). In other varieties, the low vowels would be exceptional to SVLR, but might be perceived as consistently long rather than consistently short since low vowels are generally longer than higher ones (Harris 1985).

The answer again concerns the phonotactic requirement that vowels in stressed open syllables be tense. I propose, tentatively, that a merger of all Scots low vowels as lax /æ ɒ/ was prevented specifically because this would violate the phonotactic constraint which forbids lax vowels in stressed open syllables, even though the resulting tense vowels would have an extremely restricted functional load. In some dialects, however, SVLR seems not to have affected low vowels (Wells 1982); here I assume either that the low vowels underwent merger as detailed above, except in word-final position, where tense vowels were again retained, or that tense and lax vowels were retained in the historically appropriate sets of items. In the modern Scots descendents of these dialects, lax /æ ɒ/ will be exceptions to SVLR; only /a ɔ/ will lengthen finally. However, /æ ɒ/ may again be perceived as consistently longer, due to the articulatory nature of low vowels, which increases the likelihood that these will be perceived as long. This does not mean that /æ ɒ/ need be ascribed phonemic length.

I assume, then, that Scots/SSE retain both lax (/æ ɒ/) and tense (/a ɔ/) low vowels, although the latter may in some dialects be restricted to word-final position. One result of the presence of /a ɔ/ in the Scots system, albeit marginally, is a partial explanation for the ease with which Scots/SSE speakers adopt the RP oppositions /æ/ - /ā/ and /ɒ/ - /ɔ̄/ (Abercrombie 1979); marginal contrasts approximating to these will be present in the native dialects of these speakers. However, Scots speakers have much more difficulty in acquiring /ʊ/ - /ū/, presumably because /ʊ/ is entirely absent from the synchronic SSE vowel system, shown in (22).

(22)	Lax			Tense		
	I			i		u
	ɛ	ɛ̈	ʌ	e		o
	æ		ɒ	a		ɔ
				ai	au	ɔi

Although a solution has been suggested for the immediate difficulty, producing an analysis of the Scots/SSE low vowel system which does not necessitate abandoning or reformulating the Vowel Shift Rules (which have been shown to be advantageous in other respects), this 'solution' raises theoretical problems of far greater magnitude. In this case, consideration of phonological rule interactions has indicated that underlying differences which might be predicted on the basis of surface phonetic facts cannot be as great as expected. However, this conclusion rests solely on internal evidence (with one minor piece of supporting external data concerning the acquisition of low-vowel tense-lax oppositions from RP), contrary to the claims in Chapter 1 that lexicalist analyses should gain support from internal and external sources.

It is clear that, in this instance, we are unable to distance Lexical Phonology from SGP; the argument above contains features of SGP analyses which, I have argued elsewhere, LP would be better off without. It is true that the low vowels of Scots/SSE constitute an area which merits further investigation, and that the discussion here is no more than a sketch of the problem and a tentative suggestion of a solution which I am unable at present to pursue further. Nonetheless, in the absence of a preferable solution, this must stand as an indictment of the model developed here.

3.3. Tenseness and Length

One possible example of a rather more far-reaching underlying discrepancy between Scots and SSE on the one hand, and other varieties of English including RP and

GenAm on the other, concerns the dichotomising feature(s) used in the underlying vowel system. Some controversy exists in the generative phonological literature as to whether tenseness or length should be seen as the appropriate dichotomiser.

In SPE, the two opposing, underlying categories of English vowels are characterised as tense and lax. The Stress Rules are sensitive to tenseness, as is the VSR, and quality/quantity adjusting processes are formulated as tensing and laxing rather than lengthening and shortening rules. [+ tense] is linked with [+ long], and [- tense] with [- long], by a late redundancy rule.

Halle (1977) sees [± tense] and [± long] as independent features, both present at the underlying level. This hypothesis is motivated by Halle's proposal that English dialects possess tense and lax varieties of long low vowels; tenseness and length cannot then be correlated absolutely, but must be independently manipulable. Halle furthermore proposes that the English Stress Rules should be made sensitive to length, although the input to VSR will still be [+ tense] vowels. Halle also modifies the quantity/quality adjustment rules, which will now involve both [± tense] and [± long], as shown in the subset given in (23).

(23) a.
$$V \rightarrow [-\text{long}, -\text{tense}] \;/\; \text{---}\, C_0 \begin{Bmatrix} V\ C\ V \\ C\ C \\ \text{-ic} \end{Bmatrix}$$

b.
$$V \rightarrow [+\text{long}, +\text{tense}] \;/\; \begin{bmatrix} \text{------} \\ -\text{high} \end{bmatrix} \text{CiV}$$

Thus, the Trisyllabic Laxing and CiV Tensing rules of SPE become Halle's Trisyllabic Laxing/Shortening and CiV Tensing/Lengthening.

Halle and Mohanan (1985) adopt Halle's idea that the stress rules are sensitive to length (now autosegmentally represented) rather than tenseness, and extend this also to the Vowel Shift Rule, which in their version affects long vowels. HM also reformulate the tensing and laxing rules of SPE as lengthening and shortening processes (giving CiV Lengthening, Trisyllabic Shortening, and so on), and claim that they thereby remove the feature [± tense] from the underlying inventory of English. Nonetheless, they are forced to introduce a number of lexical tensing rules, which operate partially as redundancy rules linking underlying length with surface tenseness (as in the case of Long Vowel Tensing, HM 1985, No.41, p.73), and partly to tense underlyingly short vowels (see a/o Tensing, No.44, p.74, and æ-Tensing, p.75).

HM (1985) must therefore recognise sets of near-identical lengthening and tensing rules, including Stem-Final Tensing (No.2, p.59) and Stem-Final Lengthening (No.9, p.61), or Prevocalic Tensing (No.69, p.81) and Prevocalic Lengthening (a special, minor rule applying only to *various, variety, pious, maniacal* and a few others; see p.81). A number of difficulties of derivation also arise from their failure to equate lengthening with tensing, and shortening with laxing processes; these were discussed in Chapter 2 above (and see also Borowsky 1986).

Let us turn now to Scots/SSE. HM's assertion that length is underlyingly distinctive, while [± tense] is not, is clearly unacceptable for these varieties. It is true that, in the Old English period, the ancestor language of Scots had an underlying length contrast in the vowel system, and that this was maintained into Middle English, when it was supplemented by the introduction of [± tense], as argued in the discussion of MEOSL in Chapter 4. However, the introduction of SVLR caused the neutralisation of the length contrast, and the subsequent rule inversion proposed by Pullum (1974) should have created a Scots/SSE vowel system in which [± tense] has replaced length as the underlying dichotomiser, with length supplied, by SVLR, for tense vowels in SVLR long environments. This development for Scots/SSE is schematised in (24) below, and will be expanded on in Chapter 6.

```
(24) Scots/SSE:
  a. Old English:  long versus short vowels

  b. Middle English:  long tense, short lax vowels

  c. SVLR - first generation of speakers:
     Underlying long tense versus short lax vowels
                      ↓
     SVLR:  long --> short in short contexts
            short --> long in long contexts
                      ↓
     Surface length predictable

  d. Subsequent generations:
     Rule inversion
     Underlying tense versus lax vowels, all short
                      ↓
     SVLR:  tense vowels --> long in long contexts
```

If we wish to maintain HM's assumption that the Stress Rules and VSR are sensitive to length, and that quantity/quality adjustment rules should be formulated as lengthening and shortening processes, we must reject the diachronic development sketched in (24)d., and accept rather that SVLR is retained in the modern Scots/SSE lexical phonology in the form of the complex neutralisation rule of (24)c. This conclusion would not be reached solely on the basis of evidence from Scots/SSE, which supports the hypothesis of further restructuring. For instance, the proposal of a system with length underlyingly distinctive, but predictable on the surface creates obvious problems of learnability; the child acquiring Scots will be required to divide her vocabulary along synchronically opaque lines by reversing the historical SVLR in order to internalise vowels of the appropriate length in lexical items at the underlying level. Furthermore, adopting Halle and Mohanan's analysis will mean that a great many lexical items in Scots/SSE will be stored in a form distinct from their representation at the lexical level; such discrepancies in representation for non-alternating forms have not in general been permitted in the model developed here.

The only possible motivation for this approach is its adherence to the SGP assumptions that sound changes generally remain in the language in their original, historical form, and that a common set of underlying representations should be sought for related dialects: these principles could be maintained if Scots/SSE and RP/GenAm were all analysed with underlyingly distinctive length, with the inclusion of SVLR as a complex redundancy rule locating all inter-dialectal differences appropriately in the rule system. Our version of Lexical Phonology is not governed by either of these assumptions. Indeed, we have already seen that sound changes and synchronic phonological rules need not be identical (as in the case of the Great Vowel Shift and the VSRs in Chapter 3), and that underlying discrepancies between dialects are a natural consequence of a constrained phonological model. I therefore propose that Scots/SSE should have [± tense] as the relevant underlying feature, with length specified by SVLR which, I shall argue in Chapter 6 below, operates on Level 2 of the lexicon. The Stress Rules and VSRs will then be sensitive to [± tense], and we will have Trisyllabic Laxing and CiV Tensing, rather than shortening and lengthening rules.

We must now consider our other reference varieties, RP and GenAm. As we have seen, [± tense] (SPE), both [± tense] and length (Halle 1977), and length alone (HM 1985) have all been proposed as underlyingly relevant in these varieties; and the magnitude of the underlying difference between RP/GenAm and SSE/Scots will depend on the option selected.

The choices available to us are schematised in (25).

(25) Underlyingly distinctive features:

	Scots/SSE	RP/GenAm
1.	length	length
2.	[± tense], length by SVLR	[± tense], length by redundancy rule
3.	[± tense], length by SVLR	length, [± tense] by redundancy rule
4.	[± tense], length by SVLR	length and [± tense]

Position 1. has already been rejected as inappropriate for Scots/SSE. Let us now consider options 2-4 for RP/GenAm.

Option 2: [± tense], length by redundancy rule

Accepting that [± tense] bifurcates the underlying vowel system in RP/GenAm as well as Scots/SSE will again make the underlying feature system identical in both sets of varieties, with surface differences generated by the rules; in RP/GenAm, [+ tense] will be correlated with a double timing slot configuration by a redundancy rule, while in Scots/SSE, [+ tense] vowels will be variably lengthened by the SVLR. However, this seems not to be the best option, for a number of reasons.

First, there is a historical problem. I have argued, in Chapter 4 above, that length alone was relevant in Old English, but that the feature [± tense] was introduced into the Middle English vowel system at some point prior to the operation of Middle English Open Syllable Lengthening. However, there is no apparent historical reason for [± tense] to have supplanted length in RP/GenAm, although the introduction of SVLR, the subsequent rule inversion posited by Pullum (1974) and the restriction of synchronic SVLR to tense vowels proposed above does provide such motivation for Scots/SSE.

Second, if [± tense] alone is present at the underlying level in RP/GenAm, the Stress Rules will necessarily be sensitive to tenseness rather than to length. However, it can be argued that stress rules, as essentially prosodic processes, should refer to prosodic rather than phonetic features. If stress rules are permitted to refer to [± tense], then there is "no principled way of excluding non-occurring stress rules...sensitive to the phonetic identity of individual segments (e.g. 'stress any nucleus specified as [+ back]')" (Harris 1989, p.44). The Scots/SSE data make it clear that this restriction of the features to which stress rules may be sensitive cannot be an absolute requirement, since length is not underlyingly available in these varieties; furthermore, I shall argue in Chapter 6 that SVLR operates on Level 2 of the lexicon, while the cyclic stress rules operate on Level 1, so that SVLR cannot be ordered before stress assignment to allow reference to length. This weakens the argument a little, but we might nonetheless prefer to have stress rules sensitive to length if this is reconcilable with the rest of the phonological analysis.

A third problem arises from the assumption that [± tense] is underlyingly distinctive, rather than from the proposed non-distinctive nature of length: I refer here to the discussion of æ-Tensing in Labov (1981) and Harris (1989).

In a number of varieties of English (including those of New York City, Philadelphia and Belfast), historical short /æ/ undergoes contextually determined tensing before a variable set of consonants, producing surface differences like those shown in (26).

(26) lax: tap, bat, match, back, panel, wagon...
tense: pass, path, laugh, man, Sam, dragger, manning, man hours...

Harris (1989) argues that this process of æ-Tensing is a lexical rule, since it is sensitive to morphological information, sustains lexical exceptions in certain dialects (such as Philadelphia, where /d/ is not a tensing context, but *mad, glad, bad* have tense /Æ/), produces a catergorically discriminable output (Labov

1981), and represents a problem of acquisition for speakers of other varieties (Payne 1980). However, Harris sees æ-Tensing as manipulating a non-distinctive feature, since he follows Halle and Mohanan (1985) in excluding [± tense] from the underlying feature inventory for English dialects, although he admits that a tenuous lexical contrast of tense /Æ/ and lax /æ/ may be present in New York City and Philadelphia.

Harris' account of æ-Tensing is not, however, incompatible with the assumption that [± tense] is present at the underlying level, but that tenseness is being extended, by the innovation of the æ-Tensing rule, to bisect the historical short /æ/ class which would previously have had entirely lax reflexes. Given this hypothesis, æ-Tensing is still analysable as a lexical rule, and the acquisition and categorical perception data can still be accommodated.

If this last problem can indeed be set aside, then there is in principle no objection to the recognition of [± tense] as underlyingly distinctive. However, the other difficulties discussed above indicate that it may be preferable to include only length, or perhaps both length and tenseness, in the underlying feature inventory. I shall now discuss these possibilities in turn.

Option 3: Length, [± tense] by Redundancy Rule

It is possible that my defence of the status of [± tense] as an underlying feature results from the analysis of Scots/SSE proposed here influencing my view of RP/GenAm. It may then be wise to consider more carefully the validity of Halle and Mohanan's (1985) analysis, where length is relevant underlyingly, and correlated with [± tense] by a redundancy rule. This proposal has some advantages; for instance, it coheres better with Lieber's (1979) view of the historical situation, whereby [± tense] was introduced into the system before the operation of Middle English Open Syllable Lengthening, followed after MEOSL by the implementation of a redundancy rule linking [α long] with [α tense]. Furthermore, this account would enable the Stress Rules to refer to the prosodic feature of length.

Again, however, we encounter a difficulty. As noted above, HM (1985) propose lengthening and shortening rather than tensing and laxing rules, with the Vowel Shift Rules as well as the Stress Rules sensitive to long vowels. Presumably, my VSRs could be reformulated, for RP and GenAm, to be sensitive to single and double timing-slot configurations, and be fed by shortening and lengthening rules rather than the combined laxing/shortening and tensing/lengthening processes proposed in Chapter 3, which altered prosodic and phonetic structure in tandem. However, we will still be left with the problems of derivation discussed for HM's model in Chapter 2. These difficulties are left partially unresolved by Halle and Mohanan, and are partially ameliorated by including tensing as well as lengthening rules in the lexical phonology.

It would be possible to introduce [± tense] into the lexicon, even on the first cycle and in underived environments, given that the Strict Cycle Condition does not control structure-building operations. A redundancy rule linking underlying long and short vowels with [+ tense] and [- tense] respectively could therefore apply very early in the lexicon; tensing/lengthening and laxing/shortening rules could then operate on Level 1, and many of HM's problems of derivation (which, I have argued, are largely due to a failure to link their tensing and lengthening rules) will be solved. The problem, however, is Structure Preservation.

It seems initially that Structure Preservation should prohibit the introduction of [± tense] by a lexical redundancy rule, since this involves the addition of an entirely novel feature during the lexical derivation.

Certainly, this would not be permitted until the postlexical level by the version of Structure Preservation tentatively proposed in Chapter 1 above; this was based on the assumption of a full-entry theory of the lexicon, and allowed the recombination of underlying features, but not the introduction of new ones. The role of Structure Preservation in this case will also depend on the number and type of redundancy rules recognised. For instance, Archangeli (1984) assumes that, given Underspecification and Structure Preservation, complement rules will be allowed to apply lexically, since these fill in values of features which are present at the underlying level but may be unspecified in the matrices of certain segments, but that default rules, which introduce new features, will be restricted to the postlexical subcomponent.

In fact, however, it may be possible to introduce [± tense] during the lexical derivation. Kiparsky (1985, p.93) states that Structure Preservation "determines point-blank that any rule which introduces marked specifications of lexically non-distinctive features must be postlexical." This implies that, if a rule introduces only unmarked specifications, it may operate lexically. If we then assume that, in the unmarked case in English, [+ tense] is associated with long and [- tense] with short vowels, a redundancy rule making this correlation may indeed be lexical - although tensing rules operating on underlyingly short vowels, like æ-Tensing (Labov 1981, Harris 1989), would still contravene Structure Preservation by introducing a marked value for an underlyingly non-distinctive feature.

If this option were accepted, we could recognise only length at the underlying level, but introduce [± tense] early in the lexicon, allowing lengthening/tensing and shortening/laxing rules to be formulated. The Stress Rules would be sensitive to length, and the Vowel Shift Rules would also have to be fed by quantity rather than quality adjustment, since structure-building operations cannot feed subsequent phonological rules (Kiparsky 1985).

However, in spite of these apparent advantages, there may still be some reasons for preferring the final option, which assumes that both [± tense] and length are present at the underlying level.

Option 4: Length and [± tense]

One obvious reason for recognising both length and [± tense] as underlying features in RP/GenAm is my assumption here of a full-entry theory of the lexicon. It is true that compelling arguments exist for Underspecification (see Kiparsky 1985); however, the interaction of Underspecification with Structure Preservation, markedness theory, and other constraints of LP including the Elsewhere Condition/Strict Cyclicity Condition, and the status of complement, default and redundancy rules are far from settled issues. The same applies for the extent of permissible Underspecification, and the appropriate formulation of Structure Preservation. I have concentrated on attempting to constrain LP and reduce the abstractness of the synchronic analyses generated, and am unwilling to compromise the concreteness of the theory by incorporating Underspecification theory in its current state; resolving this area is clearly beyond the scope of this work. The assumption that both [± tense] and length are underlyingly relevant, although appropriate in a model with a full-entry theory and no great investment in economy, would clearly have to be rethought in a model assuming underspecified underlying representations.

Nonetheless, there are arguments for the adoption of both [± tense] and length as underlyingly distinctive, mainly concerning the independent manipulation of these two features through the history of English and in different varieties. For example, Lieber (1979) assumes that [± tense] was introduced before MEOSL, and that a rule correlating length with tenseness subsequently transformed the output of MEOSL, long _lax_ vowels, into long tense ones. However, we need not assume that this rule acted as a redundancy rule introducing [± tense] into representations, and that length and [± tense] therefore ceased to be independent features at the underlying level. Instead, we can interpret the rule as simply re-establishing at the lexical and/or surface levels a correlation between two separate, underlyingly present features.

In addition, there is evidence (discussed in Chapter 4) that Lieber's redundancy rule was not introduced in all varieties, and that some dialects retain divergent reflexes of the long lax and long tense Middle English vowels. This correlates with Wood's (1975) assumption that, although tense vowels _tend_ to be long and lax vowels short, these characteristics cannot be linked absolutely, as the relationship between them can vary both cross-linguistically and across time in a single language. In fact, during the history of English the tenseness-length correlation has quite frequently been disrupted by changes including MEOSL, SVLR and the more recent æ-Tensing. Given these cases of independent manipulation of length and [± tense], we should perh s recognise both as underlying. There will then be no question of which 'comes first', but in many varieties of English, a _de facto_ correlation of long with tense and short with lax will exist, and this will, on the whole, be maintained throughout the derivation and on the surface. This view coheres with the formulation of quantity/quality adjustment rules presented above as simultaneously altering prosodic and phonetic structure.

The choice of the appropriate dichotomising feature for Scots/SSE and for RP/GenAm therefore reveals a difference of considerable magnitude between these two sets of varieties. In Scots/SSE, the underlyingly relevant feature is [± tense] (at least in 'core' dialects with SVLR operative for low as well as high and mid vowels), while in RP and GenAm, we should accept either Option 3 or 4 above, making either length alone or length and [± tense] underlyingly distinctive. The organisation of the underlying vowel system therefore differs quite markedly between SSE/Scots and RP/GenAm, since an additional, or an entirely different feature bifurcates the system in the latter varieties.

It is clear, then, that a Lexical Phonology of the sort presented here will necessitate considerably different underlying representations for varieties of the same language, and that these discrepancies extend beyond relatively minor systemic and distributional differences. I shall argue in the next Chapter that such underlying variation results from the innovation of new lexical rules by some varieties but not others, and from the subsequent development of such lexicalised rules.

For the moment, however, we must conclude that a language, in Lexical Phonological terms, must be seen as a collection of related varieties, but with no underlying identity or unity. As Lass (1987, p.4) puts it:

> "To say that 'Scots is a dialect of English' does not imply the (real) existence of an 'English' of which it's a dialect. Rather that 'English' is the name given to a cluster of (relatively) mutually comprehensible speech forms (the dialects) that share more features with each other than they do with any other conventionally named dialect clusters ('Dutch', 'German', etc.)".

If we are not tied to a notion of language as common underlying system, then we can also account for the gradual divergence of dialects becoming the gradual divergence of languages; on this analysis, dialect and language variation are only quantitatively, not qualitatively distinct.

This conclusion does not mean that I disregard the convenience and usefulness of core systems (like the one

Lass calls "a semi-fictitious idealised 'core' English" (Lass 1987, p.5)) for expository purposes; I introduced just such a composite system for Scots dialects and SSE in Chapter 4. It does, however, entail that such 'core systems' should be retained only for such illustrative reasons. They should be assigned neither psychological nor linguistic reality, and we cannot propose such a system as the underlying level of a constrained Lexical Phonology and expect the model to generate the 'offspring' varieties.

Chapter 6

Synchrony, Diachrony and Lexical Phonology

1. Introduction

In Chapter 5, it was proposed that two vowel lengthening processes, Low-Level Lengthening and the Scottish Vowel Length Rule, operate synchronically in Scots dialects and SSE, while only LLL applies in other varieties of English, including RP and GenAm. We will now return to these two rules, attempting to give a more adequate formulation of each, and considering their ordering in the model of Lexical Phonology assumed here. Although SVLR and LLL will be shown to be independent processes in synchronic terms, I shall argue that a diachronic relationship holds between them, and the remainder of this Chapter will focus on the history of SVLR. Ultimately, this consideration of the development of SVLR will address the third question from Chapter 1, concerning the links between synchrony and diachrony revealed by phonological theory. We have already seen that the unsatisfactory assumption of identity of sound changes and synchronic phonological rules characteristic of Standard Generative Phonology is untenable in a constrained model of LP; I shall argue that this is replaced by a correlation of two types of sound change with lexical and postlexical rules, and that the adoption of LP permits an illuminating formalisation of the 'life cycle' of sound changes and phonological rules.

2. The Synchronic Formulation of SVLR and LLL

2.1. The Environment of SVLR and LLL

It was argued in Chapter 5 above that Agutter's (1988a, b) data, although not conclusive, are at least as compatible with the assumption that SVLR does operate

Scots-specifically as with Agutter's own contention that it does not. On the basis of these data, and other work on vowel lengthening in Scots and elsewhere, SVLR was distinguished from the pan-dialectal process which I have called Low-Level Lengthening (LLL).

If the two processes of LLL and SVLR do co-exist in SSE and Scots dialects, they must be individually characterised. In fact, each has a distinct input and environment: LLL applies to all vowels before all voiced consonants and word-finally (or, perhaps more accurately, pre-pausally), while SVLR is much less general, affecting only a subset of the vowel system, before voiced fricatives, /r/ and], the bracket used in Lexical Phonology to replace traditional word and morpheme boundary. We established and formulated the input conditions for SVLR in Chapter 5 (see (10), Section 2.2.), and must now attempt to characterise the environment more satisfactorily. To do so, we must address the question of why vowel lengthening should occur preferentially in these particular SVLR contexts.

During the discussion above of universal, physiologically conditioned lengthening of vowels before voiced as opposed to voiceless consonants and before fricatives as opposed to stops, it was noted that the relevant factors determining length seem to be voicing, and the different rates of transition between adjacent vowel and consonant closures. Harris (1985, p.121) expands on this point, asserting that:

"We are dealing with rate of closure transition as a determinant of vowel duration. The relatively longer duration of vowels before fricatives is a function of the comparatively long time it takes the active articulator to perform the controlled movement required for assuming a position of close approximation with the passive articulator. With stop consonants, the closure transition from a preceding vowel is shorter, since the achievement of a stricture of complete closure does not require the same degree of muscular control as that required for a fricative. The vowel is therefore correspondingly shorter."

Harris proposes a consonant scale on which elements are classed according to the features [± voice] and [± continuant]; voiceless non-continuants will appear at the extreme left of the scale, and will not lengthen vowels, whereas voiced continuants, which most affect the duration of preceding vowels, will be located at the extreme right.

Similar consonant scales have been employed in previous attempts to characterise SVLR. For instance, Ewen's (1977) formulation of the synchronic SVLR in the framework of Dependency Phonology, and Vaiana Taylor's (1974) statement of the historical rule both rely in the invocation of a strength or sonority hierarchy. However, Harris himself (1985, p.91) points out a number of problems with this interpretation of SVLR lengthening as 'preferential strengthening'.

First, Vaiana Taylor's sonorance scale does not differentiate /l/ from /r/, but subsumes both under the classification 'liquid', although SVLR operates in the environment of the latter but not the former.

Secondly, nasals are assigned no place on Vaiana Taylor's scale, but, according to similar sonority hierarchies proposed by Vennemann and Hooper, for instance, should be intermediate between voiced fricatives and liquids, as shown in (1).

(1)

```
     t    s    d    z    n    l    j    i    ii
   ------------------------------------------------>
                      sonority
```

Thus, lengthening should affect vowels in the context of nasals and liquids before it affects them in the environment of voiced fricatives, and this is certainly not the case for SVLR.

Consequently,

"given the ranking (in order of increasing strength) voiced fricatives - nasals - liquids, it is impossible to separate out the class of Aitken's Law 'long' consonants (i.e. /ð z ʒ v r/) without destroying the principle of preferential ordering that lies at the very heart of the concept of phonological strength" (Harris 1985, pp.92-3).

In the case of Ewen's syllabicity hierarchy, the elements involved in SVLR (i.e. vowels, liquid /r/ and voiced fricatives) similarly form a discontinuous sequence.

However, Harris's voicing and continuance scale does seem to permit a positioning of nasals and /l/ which accounts for their status as long contexts for the pan-dialectal LLL but as short contexts for SVLR. Harris classifies the nasals with the voiced stops on the grounds that:

"the oral gesture required for nasal stops is the same as that required for oral stops, i.e. an abrupt, ballistic movement appropriate for a stricture of complete closure. This manner of articulation...favours a shorter duration of preceding vowels. Hence nasals are Aitken's Law 'short' environments" (Harris 1985, p.122).

Nasals, as voiced non-continuants, are therefore placed with voiced oral stops to give the provisional scale in (2).

(2)

```
        t     s     d     z
                    n
    ---------------------->
           V length
```

The separation of the liquids /l/ and /r/ is rather less straightforward. Harris argues that /r/, which has an approximant articulation for most modern Scots and SSE speakers but was probably a fricative in earlier stages of Scots, should be labelled [+ voice, + continuant] and classed with the voiced fricatives, as shown in (3).

(3)

```
        t     s     d     z
                    n     r
    ---------------------->
           V length
```

However, /l/ is generally also classed as [+ voice, + continuant], as in SPE, and yet is not a long context for SVLR. /r/, but not /l/ can, however, be regarded as part of a phonological class with the obstruents; Lass (1974, p.17) cites some evidence for this alignment from Scots, where,

"...in dialects (like most Southern and Central Scots) which show terminal devoicing of obstruents, /r/ also devoices, but never /l/ or the nasals."

Harris also draws attention to other instances in various languages where /l/ patterns with noncontinuant segments and is itself perhaps better regarded as a noncontinuant. For instance, in certain dialects of American English, such as that of New York City, where /æ/ undergoes phonetically conditioned lengthening, /l/ and the voiceless stops are short environments. Similarly, certain vowels in conservative metropolitan French show positionally conditioned length, with short variants occurring before stops, voiceless fricatives, nasals and /l/, and long ones before /r/ and voiced fricatives - a French Aitken's Law. Further afield, in Swahili /l/ and /d/ alternate morphophonemically, while [l] and [d] in Sesotho are allophones of one phoneme (Harris 1985, pp.122-3).

Chomsky and Halle (1968, p.318) themselves note this difficulty, in connection with their sole, little-noticed, discussion of an example from Scots:

"...there are other facts in different languages which suggest that [l] is best regarded as a noncontinuant....Thus, for instance, in certain dialects of English spoken in Scotland, diphthongs are lax before noncontinuants and tense before continuants....Thus there is [r'ʌyd] but [r'ayz]. The liquids [l] and [r] pattern in parallel fashion, the former with the noncontinuants and the latter with the continuants: [t'ʌyl] but [t'ayr]."

However, a classification of /l/ as noncontinuant is clearly impossible given the SPE definition of continuancy in terms of the presence or absence of complete obstruction of the airflow through the oral cavity. Chomsky and Halle consequently propose a slight redefinition of the feature [± continuant] which relies instead on the presence or absence of blockage of the airflow past the primary stricture. As Harris puts it (1985, p.123),

"if the location of the primary stricture is understood to be along the sagittal plane of the oral cavity, then [l] will be classified as [- continuant] since, as with [d], it is produced with complete closure at the alveolar ridge."

Now that the nasals and the lateral have been classified, along with the voiced oral stops, as [+ voice, - continuant], Harris's combined voicing and continuancy scale can be represented as in (4).

(4)

```
                d
    t     s     n     z
                l     r
-------------------------->
            V length
```

The environments for SVLR and LLL are now readily statable in relation to Harris's consonant scale. In RP and GenAm, the one relevant lengthening rule applies before all voiced consonants, both continuants and noncontinuants; that is, lengthening will take place everywhere to the right of the vertical line in (5), with vowel duration increasing progressively the further right on the scale a following consonant is located, and with even greater length pre-pausally, although the scale has been restricted at present to consonantal environments.

```
(5)  RP/GenAm
                        |   [+ voice]
                        |   d
          t      s      |   l       z
                        |   n       r
     -------------------|------------------->
               increasing V length
```

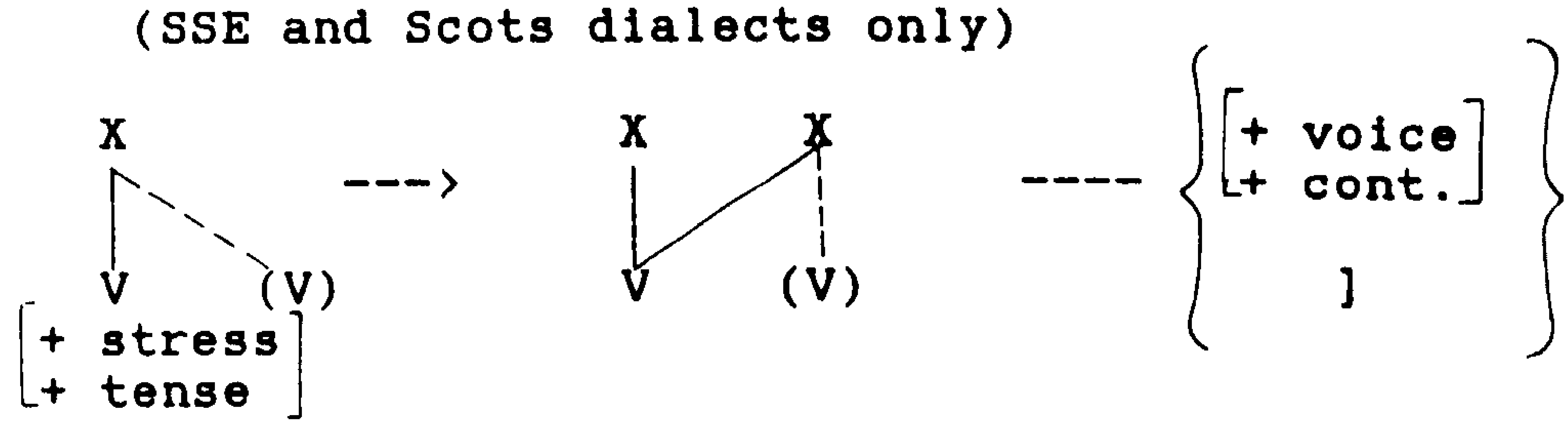
In Scots, this rule also applies, in the same environments, but SVLR also operates before voiced continuants, thus on the right of the rightmost vertical line in (6).

```
(6)  Scots/SSE
                          |   [+ voice]
                          |   d |
        t        s        |   n |       z
                          |   l |       r
                          |     | [+ continuant]
     ---------------------|-----|----------------------->
                    increasing V length
```

SVLR and LLL, then, apply in partially overlapping contexts, but can be differentiated in terms of their inputs and the environments in which they apply.

This discussion enables us to formulate the environment for SVLR using features, and the resulting rule is shown in (7). Note that SVLR will simply lengthen /ai/ to [a:i], given the assumption that /ai/ rather than /ʌi/ is the appropriate underlying representation for this diphthong; SVLR will then operate equivalently for all affected vowels, altering only quantity and never quality. However, a minor rule will be required to produce [ʌi] in short contexts, and thus to account for the quality difference between [ʌi] and [a:i]. An informal version of LLL is given in (8).

(7) The Scottish Vowel Length Rule
(SSE and Scots dialects only)



(8) Low Level Lengthening
(all varieties of English)

All vowels lengthen before any voiced consonant and utterance-finally, with duration increasing progressively in the following environments: (nasal, voiced stop, lateral) - (/r/, voiced fricative) - (pre-pausal)

2.2. The Ordering of SVLR and LLL in a Lexical Phonology

Our next task is to consider the ordering of LLL and SVLR in a Lexical Phonology of the sort adopted here. First, we should ascertain whether each rule is lexical or postlexical; if either is lexical, evidence must be found for the appropriate stratum.

Various criteria for distinguishing lexical from postlexical rule applications are suggested by, for instance, Kiparsky (1982) and Mohanan (1982, 1986); these criteria were discussed in Chapter 1 above, and a subset is given in (9). I shall consider these properties in turn.

(9)

Lexical	Postlexical
Speakers aware of operation	Speakers unaware
Binary output	Scalar
Sensitive to morphology	Purely phonetically conditioned
Apply only within words	Apply across words

a. Speaker Awareness

It is generally the case that postlexical rules are automatic phonetic processes, like aspiration of voiceless stops in English, and that native speakers fail to observe their effects. It seems that Low-Level Lengthening meets this criterion, in that English speakers seem to be unaware of its operation. Thus,

"Some speakers will make a distinctive difference of length between *bomb* and *balm*, but they will make a larger difference of length - though non-distinctive - between *leap* and *leave*. And the naive subject will easily be made conscious of the first difference of length but not the second" (Delattre 1962, p.1142).

However, while native speakers of English do not seem to notice the operation of LLL, Scots/SSE speakers seem to be generally aware of the differences produced by SVLR (or can easily be made aware of them), and are frequently able to distinguish long from short Scots vowels.

b. Binarity

Postlexical rules are usually said to produce a non-binary output; this tallies with Mohanan's claim (1986, p.157) that

"while phonological representations contain segments which are specified in terms of binary features, phonetic representations make use of scalar values."

Since LLL increases the duration of long and short vowels by a variable amount, depending on the nature of the following consonant, its output is essentially non-binary. In contrast, SVLR appears to control a binary, categorisable distinction of length: SVLR produces long vowels; vowels outside SVLR contexts, and exceptional vowels in such contexts, are short.

c. Sensitivity to Morphology

Mohanan's major criterion for distinguishing between lexical and postlexical rules involves sensitivity to the morphology: "A rule application requiring morphological information must take place in the lexicon" (1986, p.9). LLL might initially seem to be lexical by this criterion, since sensitivity to morphological information would include sensitivity to the presence of boundaries, and vowels are lengthened word-finally. This assignment of LLL to the lexicon conflicts with the postlexical characterisation supported by other criteria. However, this conflict may be resolved by assuming that LLL affects vowels utterance-finally, or pre-pausally, rather than word-finally; since pauses would tend to be inserted after syntactic concatenation (Mohanan 1982), it follows that a rule referring to the position of pauses is necessarily postlexical. SVLR, on the other hand, is clearly sensitive to morphological information, and indeed a boundary is included in its structural description. SVLR lengthens vowels word-finally, but also before regular inflections, even when the consonant following the boundary is not itself a lengthening context; /i/ is therefore lengthened in *sees* [si:z] and *keyed* [ki:d], and in *brewed* and *tied* but not *brood* and *tide*.

d. Application Between Words

SVLR applies only within words. However, informal observations suggest that LLL may operate across word-boundaries, another typical feature of postlexical rules, although at present I have no experimental evidence to verify this.

On the basis of these four criteria, LLL can be classified as clearly postlexical, and SVLR as tenuously lexical. Further evidence regarding the sensitivity of SVLR to morphology supports the assignment of this rule to Level 2 of the lexicon; relevant data are shown in (10).

(10)

[i]	[i:]	[u]	[u:]
feed	key]ed	brood	brew]ed
Healey	free]ly	Souness	blue]ness
feline	bee]line	stupid	stew]pot
[o]	[o:]	[ʌi]	[a:i]
road	row]ed	tide	tie]d
bonus	slow]ness	Reilly	dry]ly
Snowdon	snow]drop	typ-ing	tie]pin

(from Harris in press)

The examples in (10) show that SVLR operates when the affected vowel is stem-final in a Class II derived or regularly inflected form, or in the first stem of a compound, but not in morphologically underived forms with similar phonological contexts. In the model proposed here, Class II derivation, regular inflection and compounding all take place on Level 2. I can find no evidence of such sensitivity to Level 1 morphology, nor any indication of cyclic application, and SVLR also need not precede any Level 1 rule. I conclude that SVLR operates on Level 2 of the lexicon.

3. The History of the SVLR

3.1. Introduction

The discussion above supports the formulation of SVLR and LLL as synchronically distinct processes. However appropriate this separate characterisation may be, it misses the intuition that the two rules are in some sense related, as evidenced by the inclusion of SVLR inputs and environments in the set of operational contexts for LLL. I shall argue that this relationship can be accounted for in diachronic terms, and that SVLR has been 'derived' historically from LLL, with the rather tenuous adherence of SVLR to the criteria of the lexical syndrome of properties indicating fairly recent lexicalisation.

This development of SVLR will be shown to be one example of a probably rather common 'life cycle' of sound changes, which may begin as low-level rules, then move into the lexicon, and eventually become opaque and promote restructuring at the underlying level, thus producing dialect and ultimately language variation. The case of SVLR will illustrate that LP can reveal connections of synchrony and diachrony which were impossible to capture in SGP. Before assessing the importance of SVLR, however, we should review previous attempts to relate synchronic phonological rules and diachronic sound changes.

3.2. The Relationship of Synchrony and Diachrony

The Standard Generative approach to historical linguistics was discussed in Chapter 1 above. The key assumption is that each sound change, once implemented, is incorporated directly into the adult speaker's phonological rule system as the final rule, moving gradually up into the grammar as subsequent changes are introduced. Restructuring of the underlying representations during acquisition by later generations of speakers is theoretically permitted, but infrequently invoked, and the result is that the historical phonology of a language will be almost directly mirrored in the order of its synchronic phonological rules. The only extractable generalisations are that the 'highest' rules will correspond to the oldest changes, and that a sound change and the phonological rule into which it is converted will tend to be identical or at least show a high degree of similarity in formulation. This approach is not particularly illuminating, and is entirely inadequate to deal with relatively recent findings on the propagation of sound changes through speech communities (Labov 1972, Wang 1977).

There are two, apparently diametrically opposed, views on the implementation of sound change in a speech community. The first, and also the earliest in chronological terms, is the Neogrammarian position which holds that sound change is phonetically gradual but lexically abrupt: that is, a sound change will proceed by minute, gradual and unobservable phonetic increments, but will affect simultaneously all lexical items containing the appropriate context. The opposing view characterises the Lexical Diffusionists (Wang 1969, 1977; Chen and Wang 1975), who believe that sound change is, conversely, phonetically abrupt and lexically gradual. In this view, sound changes involve a number of perceptible phonetic steps, and begin in a single word or a small number of words, spreading gradually in the so-called 'S-curve' pattern across the set of eligible lexical items.

Labov (1981) aims to resolve this controversy by considering evidence from language change in progress, but the data fail to argue unambiguously for one position. Instead, Labov is readily able to find cases of Neogrammarian and diffusing changes in progress, leading to an apparent impasse where we are

"faced with the massive opposition of two bodies of evidence: both are right, but both cannot be right" (Labov 1981, p.269).

Labov's solution is to accept that there are in fact two distinct types of sound change; one behaves as predicted by Neogrammarian theory, while the other is implemented by diffusion. Labov then attempts to delineate these two types as sharply as possible, and the result is the classification in (11).

(11)	Lexical diffusion	'Neogrammarian' change
Discrete	yes	no
Phonetic conditioning	rough	fine
Lexical exceptions	yes	no
Grammatical conditioning	yes	no
Social affect	no	yes
Predictable	no	yes
Learnable	no	yes
Categorised	yes	no
Dictionary entries	2	1
Lexical diffusion	yes	no

Labov adds that Neogrammarian changes involve modifications to low-level output rules, while lexical diffusion causes a redistribution of some abstract class into other classes. Finally, he tentatively proposes that certain features are associated with certain types of change: for vowels, low-level, Neogrammarian sound changes will manipulate features of fronting, backing, raising, rounding and so on, while the more abstract diffusing changes will involve tensing and laxing, lengthening and shortening, and monophthongisation and diphthongisation.

Within Standard Generative Phonology, Labov's two types of sound change have no analogues; in particular, it is unclear precisely what 'more abstract' or 'lower level' sound changes might relate to in terms of the synchronic phonology. However, it seems that these problems have a solution in Lexical Phonology.

Kiparsky (1988) points out that the sets of properties identified by Labov (1981) as characteristic of diffusing and Neogrammarian changes (see (11)) overlap to a considerable extent with the properties of lexical and postlexical rules (see (12)). Kiparsky consequently proposes to equate diffusing sound changes with lexical rules, and Neogrammarian changes with postlexical rules.

(12)

Lexical	Postlexical
Apply within words	Also apply between words
Have lexical exceptions	Apply across the board
May be cyclic	Non-cyclic
Binary/discrete output	Gradient/scalar
Observable/categorisable	Speakers unaware
Sensitive to morphology	Phonetically conditioned
Structure Preserving	May introduce novel segments or features

It is clear that some of the criteria in the relevant columns of (11) and (12) match exactly: for instance, both lexical rules and diffusing changes have discrete, categorisable effects observable by speakers, may have lexical exceptions, and are sensitive to morphological information. Kiparsky also proposes that a number of less obviously connected properties are in fact related. He argues, for example, that lexical selectivity and lexical diffusion are linked, since a diffusing rule will begin to operate outside its original conditioning context. Kiparsky also relates the necessity for two dictionary entries, which Labov cites as a property of diffusing changes, to the property of Structure Preservation, which states that no lexical rule may introduce or operate on a feature which is not underlyingly distinctive.

However, this direct, complete identification of diffusing and Neogrammarian changes with lexical and postlexical rules respectively may be too inflexible. It is not clear that all lexical rules start out as lexical or diffusing; it may rather be the case that many processes begin as low-level, automatic and phonetically motivated Neogrammarian changes, but subsequently percolate into the more abstract regions of the grammar, becoming synchronically lexical rules. Harris (1989) discusses one such example, the rule of æ-Tensing.

A contextually determined rule tensing short, stressed /æ/ (see (13)) operates in a number of varieties of English, including the New York City, Philadelphia and Belfast dialects.

(13) æ-Tensing:

$$\begin{bmatrix} +\text{ low} \\ -\text{ back} \end{bmatrix} \text{---}\!> \quad [+\text{ tense}] \quad / \quad \begin{array}{ccc} & \sigma_s & \\ X & & X \\ | & & | \\ \text{---} & & [F] \end{array}$$

As (13) shows, /æ/ tenses in these varieties before certain tautosyllabic consonants; [F] is 'shorthand' for this conditioning class of consonants, which varies between varieties. In Philadelphia, tensing occurs only before anterior nasals and anterior voiceless fricatives;

in New York, it applies additionally before voiced stops; and in Belfast, tense [Æ] surfaces in all these contexts and also before /l/ and voiced fricatives. (14) shows examples which would be tense or lax in all three dialects.

(14)

Lax: tap, bath, match, manner, ladder, wagon...
Tense: pass, path, laugh, man, Sam, manning, man hours...

Harris argues that æ-Tensing is a lexical rule in these varieties, for the following reasons. First, æ-Tensing is sensitive to morphological information, since

"the effects of the rule manifest themselves in forms containing a surface heterosyllabic tensing consonant if this is immediately followed by a word-internal morpheme boundary" (Harris 1989, p.45).

This is the case, for instance, in *manning* and *man hours*. The rule may also be lexically selective, as happens in Philadelphia, where *mad, bad, glad* have tensed [Æ] although /d/ is not generally a tensing context in this dialect. Furthermore, Labov (1981) reports that lax [æ] and tense [Æ], the output of the æ-Tensing rule, are subject to categorial discrimination by New York and Philadelphia speakers. However, Harris does not assume that æ-Tensing is a lexical rule in all varieties of English. He proposes instead that æ-Tensing was historically a phonetically motivated sound change, operating in the hierarchy of environments given in (15).

(15)

voiceless stops	voiced oral non-continuants	nasals	voiceless fricatives

--->

increasing likelihood of tensing
(after Harris 1989, No.12, p.48)

This automatic phonetic process is still applicable, in the form of a very low-level phonetic output rule, in certain varieties (including RP: Harris 1989, p.49). However, in other dialects it has been phonologised, and has reached various stages in its life-cycle in different synchronic varieties. For instance, in Detroit, Chicago and other northern US cities, æ-Tensing is synchronically a postlexical rule, applying across the board. In New York City, Philadelphia and Belfast, as we have seen, æ-Tensing is a lexical rule, having become sensitive to morphological information, categorisable, and in some cases lexically selective. The only factor which might argue against the characterisation of æ-Tensing as lexical in this set of dialects is its contravention of Structure Preservation; as noted in Chapter 5 above, Harris follows Halle and Mohanan (1985) in assuming that [± tense] is not part of the underlying feature inventory for English. However, Harris tentatively suggests that newly lexicalised rules may violate Structure Preservation temporarily, with the reassertion of Structure Preservation perhaps determining the direction of future change, although he produces no clear evidence of this determinative role of Structure Preservation. Finally, in some dialects æ-Tensing is no longer a synchronically productive rule, but has caused a restructuring at the underlying level. In RP, for instance, the historical short /æ/ class has split, with the tense reflex merging with /ɑ̄/ from other sources, including earlier /ɑr/, in *path, laugh* and so on.

Harris's discussion of æ-Tensing suggests that the incorporation of a sound change into the synchronic grammar may have a number of increasingly abstract stages. Changes may be phonologised as postlexical rules, but may subsequently acquire properties from the lexical syndrome, notably sensitivity to morphological structure, and become lexical phonological rules; these may initially violate Structure Preservation, but might be predicted to attain conformity with this principle over time. Newly lexical rules may also begin to diffuse, as is the case with æ-Tensing in Philadelphia, where the tense reflex is now appearing before /d/ in certain lexical items.

Ultimately, a lexical rule may cease to be transparent and productive. For instance, the number of lexical exceptions may increase to a point where the rule is no longer readily learnable; the rule itself will then be lost, but its effects will be incorporated into the underlying representations. What is being proposed here is, in effect, a phonological analogue of Lightfoot's (1979) Transparency Principle in diachronic syntax. In both cases, a build-up of opacity, exceptionality or derivational complexity reaches some threshold of tolerance, and a radical restructuring is required to restore learnability and transparency. Lightfoot does not attempt to define precisely the degree of tolerable opacity, nor to formalise the Transparency Principle; and I, similarly, come to no conclusion on the amount of complexity required before a lexical rule is lost and replaced by a change in the underlying representations. I note simply that the parallelism is an interesting one, and that Lightfoot's approach coheres with many of the anti-abstractness policies of the Lexical Phonology presented here, especially as

> "the Transparency Principle requires derivations to be minimally complex and initial underlying structures to be 'close' to their respective surface structures" (Lightfoot 1979, p.121).

If Harris's interpretation of the history of æ-Tensing is correct, Lexical Phonology gains considerably in a number of domains. Labov's two types of sound change can be matched with credible synchronic counterparts, and his notion of more and less abstract changes linked with the lexical-postlexical division (although, as Harris notes, the case of æ-Tensing shows that Labov's correlation of particular features with only one type of change or rule cannot be maintained: [± tense] is clearly associated with both lexical/diffusing and postlexical/Neogrammarian processes). It is also clear that, whereas SGP was a static model, in which the incorporation of change into the synchronic grammar and the resultant progressive differentiation of dialects and languages were equally unformalisable, LP does not suffer from these shortcomings. Instead, the lexicalisation of rules and their eventual loss provides a mechanism for alteration of underlying representations and for the introduction of surface and underlying variation between dialects. In the following section, I shall show that SVLR provides further evidence for these proposals, and constitutes an arguably even clearer illustration of the life-cycle suggested above, albeit with some interesting differences from Harris's example of æ-Tensing.

3.3. The Case of the Scottish Vowel Length Rule

Although we have now settled on an appropriate formulation of the synchronic SVLR, I have so far introduced only one view of the historical SVLR, the composite account from Lass (1974) and Pullum (1974) mentioned in Chapter 4 (Section 5.2.10.). I shall briefly reintroduce this account here, before proposing an alternative analysis.

Lass (1974) sees the historical SVLR as a bipartite change, incorporating one lengthening and one shortening process, which neutralised the vowel length distinction in Scots. A version of Lass's formulation is given in (16). Lass himself restricts subrule (b) to nonhigh short vowels; I have modified the formulation to include instead short vowels with tense sources, for reasons given in Chapter 5, Section 2.2. above.

(16)a. All long vowels shortened everywhere except before /r v z ʒ ð/ or].

b. Short vowels with tense sources (i.e. NOT /I ʌ ɛ/) lengthened in the same contexts.

(In some varieties, the low vowels were excepted from a., and are consistently long synchronically.)

Lass's SVLR clearly makes vowel length predictable. Pullum (1974) therefore argues that the implementation of the historical SVLR would inevitably have led to a restructuring of the underlying Scots vowel system, by the mechanism of rule inversion (Vennemann 1972). In other words, speakers would no longer learn a vowel system with an underlying length contrast, plus a complex neutralising rule based directly on the historical SVLR in (16); instead, they would abduce that all vowels are underlyingly short, and lengthen a subset of these vowels before /r/, voiced fricatives and boundaries, producing the synchronic SVLR in (7) above.

However plausible this account may be, it treats SVLR very much as an isolated phenomenon, and does not reveal the connections we suspect of existing between SVLR and LLL, the 'voicing effect' rule. I assume instead that LLL and SVLR exemplify two stages in the life cycle of sound changes which Harris (1989) illustrates using the æ-Tensing process.

We can assume that the 'voicing effect' lengthening, like æ-Tensing, began as a phonetically motivated, automatic, low-level process; in Chapter 5, it was noted that this lengthening is often said to be universal (Zimmerman and Sapon 1958, Peterson and Lehiste 1960, Delattre 1962, Chen 1970), and again, an automatic phonetic output rule seems to be in operation in synchronic varieties which lack a higher-level phonological reflex of the process. We can posit for this lowest level rule a hierarchy of operational environments as in (17).

(17)

```
                                   voiced stops   voiced
voiceless   voiceless              nasals        fricatives   pre-
stops       fricatives             lateral         /r/        pausal
----------------------------------------------------------------------->
              increased likelihood of vowel lengthening
```

In some varieties, this automatic phonetic, putatively universal process has been phonologised as a postlexical rule, which I have been calling Low-Level Lengthening. This rule, as shown above, has all the characteristic properties of a postlexical process, and applies to all vowels, producing increased length before all voiced consonants and pre-pausally, or in contexts to the right of the vertical line in (18).

(18) Low-Level Lengthening:

```
                        |  v'd stops    v'd
 v'less      v'less     |  nasals       frics.    pre-
  stops      frics.     |  lateral       /r/      pausal
```

In a third set of synchronic varieties, namely Scots dialects and SSE, a further stage of phonologisation has taken place. I assume that the extreme lengthening environments of the schema represented by LLL were phonologised in Scots/SSE as a separate rule, which has acquired certain properties of the lexical syndrome, and hence been relocated in the lexical phonology. The overlapping contexts of LLL, which operates before voiced consonants and pauses, and SVLR, which applies in these varieties only before voiced continuants and boundaries, are shown in (19).

(19)

```
                         |   Low Level Lengthening
                         |  v'd stops  |  v'd       pre-
 v'less      v'less      |  nasals     |  frics.    pausal
 stops       frics.      |  lateral    |   /r/      or ]
                         |             |     SVLR
```

I can tentatively suggest one route by which this separation of the two processes, and the eventual lexicalisation of SVLR, might have taken place. Initially, we might propose an even further modified version of Lass's (1974) historical SVLR. However, whereas Lass assumes simultaneous lengthening and shortening, I suggest that no shortening may have been involved. Instead, I propose that tense vowels underwent some additional lengthening in Middle Scots before voiced continuants and pre-pausally. Since these are the contexts which are in any case most conducive to vowel lengthening, and since one general characteristic of tense vowels is their greater length relative to lax vowels, this extra increase in duration might have been sufficient to cross the perceptual threshold for durational differences, making this lengthening audible, as previous lengthening controlled by LLL had not been. If speakers could auditorily distinguish tense vowels in these extreme lengthening contexts from all other vowels due to their extra length, we might propose a perceptual recategorisation, whereby just these vowels in these SVLR long contexts were reinterpreted as long, and all others as short. By affecting only tense vowels with tense sources, this historical SVLR also disrupted the previously perfect correlation of tenseness with length. After the introduction of SVLR, tense vowels could no longer be defined as those vowels which are always long, but rather as those which are sometimes long; that is, those vowels with audibly long realisations in some contexts. From this point, it is a very small step to assume that [+ tense] became the crucial feature specification defining the input to the synchronic SVLR, which would then have separated from LLL. Scots speakers would no longer operate with an underlying vowel system contrasting long and short vowels; instead, length would be predictable on the basis of the pre-existing feature [± tense] and the new SVLR, as formulated in (7) above.

However, I assume that LLL was also retained, continuing to produce minor and arguably inaudible alterations in the length of all vowels.

The only problematic aspect of this account of the separation of SVLR from LLL involves, again, the low vowels. The facts of Scots dialects reported in Chapter 5, 3.2. above suggest that, in at least some varieties, low lax /æ/ and /ɒ/ must have undergone SVLR lengthening. In the account just described, however, only tense /a ɔ/ should have been affected by historical SVLR, while /æ ɒ/, which lack tense sources, should have undergone only LLL. However, given that low vowels are generally longer than high ones for articulatory reasons (Harris 1985, p.110), we might assume that the lax low vowels attained sufficient length in the extreme lengthening environments of LLL to be included in the perceptual recategorisation following the extra SVLR lengthening of tense vowels: lax low vowels in SVLR environments would then be perceived as long. If we assume that this inclusion of the lax low vowels in the input of SVLR happened in some Scots dialects but not others, we might also have the beginnings of an explanation for the rather unclear synchronic status of the Scots/SSE low vowels discussed in Chapter 5.

I have indicated one possible route for the separation of SVLR from its source, the postlexical rule of Low-Level Lengthening. However, separation does not necessarily entail lexicalisation, and our next task is to ascertain how the nascent SVLR could have acquired the properties of a lexical rule. It should, however, be noted at this stage that SVLR can already be seen to differ in two ways from Harris's example process of æ-Tensing. First, æ-Tensing is present in different dialects of English as either a postlexical or a lexical rule, whereas SVLR seems to have developed in Scots/SSE from a postlexical process which remains productive in these varieties. Second, and perhaps more strikingly, SVLR does not seem to be following the same life cycle as æ-Tensing in all respects. æ-Tensing has caused a change at the underlying level in some dialects, but only at the end of a period of increased opacity and fossilisation as a lexical rule, which is ultimately lost. However, SVLR, whichever formulation we choose, neutralised the vowel length distinction in Scots varieties before becoming, or while becoming, a lexical rule.

The most feasible course for SVLR to have followed in its acquisition of lexical properties involves analogy. We can assume that the final vowel in infinitival forms like *die* would have lengthened by LLL and the new SVLR, since it is in pre-pausal position. However, there is no lengthening context for SVLR in the past tense form *died*, which would surface with a short vowel in post-SVLR Scots. A tendency towards restoring iconicity might then have caused the lengthening to be generalised into this originally inappropriate environment. This innovation would have led to the reformulation of the rule to include a bracket or boundary, making SVLR sensitive to morphological information and therefore lexical.

Once a rule has acquired some characteristic of lexical application in this way, and consequently been propelled into the lexicon, we might expect it to begin to exhibit further properties from the lexical syndrome. This is the case for SVLR; for instance, lexical rules generally produce results which are observable or categorisable by native speakers, while postlexical rules do not, and many Scots/SSE speakers can in fact distinguish long vowels in SVLR contexts from short ones elsewhere. This observability does not entail that the length contrast must be present at the underlying level, since it is generally assumed within LP that speaker judgements on distinctness of sounds are based on the lexical rather than the underlying level (Mohanan 1986, and see Chapter 1 above): vowel length in Scots/SSE will then be a "derived contrast" (Harris, in press), which is produced during the lexical derivation.

However, this assumption that vowel length is no longer underlyingly distinctive in Scots/SSE is important for another reason, which may invalidate my assignment of the synchronic SVLR to Level 2 of the lexicon. If SVLR is indeed lexical, and if we wish to maintain Kiparsky's (1988) correlation of sound changes and rule types, the rule should exhibit certain other properties. First, the principle of Structure Preservation permits lexical rules to operate on or introduce only underlyingly distinctive features; but since I have argued that SVLR neutralised the long-short contrast early in its life-cycle, it synchronically manipulates a non-contrastive feature, and therefore contravenes Structure Preservation. We cannot assume that lengthening and shortening rules are exempt from Structure Preservation; it is true that such processes operate on prosodic attachment properties rather than strictly binary features, but the version of Structure Preservation adopted throughout this thesis (and repeated for convenience in (20)) makes reference to basic or unmarked prosodic templates as well as features. It is clear that long, or double-attached vowels do not form part of the inventory of basic prosodic templates for Scots/SSE, and therefore that any lexical rule producing such a structure is in contravention of Structure Preservation.

(20) Structure Preservation:

> "Lexical rules may not mark features which are non-distinctive, nor create structures which do not conform to the basic prosodic templates of the language."
>
> (Borowsky 1986, p.29)

Furthermore, Kiparsky (1988) asserts that, once rules become lexical, they are free to undergo lexical diffusion. However, I have given no indication that SVLR is undergoing or has undergone such diffusion.

In fact, there are signs of incipient lexical diffusion of SVLR, although this is at present limited to one vowel, the diphthong /ai/. I have been assuming so far that /ai/ surfaces as [ʌi] in SVLR short environments, but as [a:i] in long contexts. However, the long realisation, [a:i], is now being generalised into lexical items lacking such long contexts, giving [pa:ilɒn] *pylon*, [spa:idər] *spider* (compare [wʌidər] *wider*), [va:ipər] *viper* (compare [wʌipər] *wiper*) and [fa:il] *phial* (compare [fʌil] *file*). This extension of long [a:i] is still sporadic, speaker-specific and highly variable, but appears to be spreading; indeed, Aitken (1981), Abercrombie (1979) and Wells (1982, p.399ff.) consider the evidence sufficient to posit a phonemic split of /ʌi/ - /a:i/, either completed or in progress, with Wells (1982, p.405) adding that the presence of a qualitative as well as a quantitative distinction between [ʌi] and [a:i] "seems to make speakers...more disposed...to regard /a:i/ and /ʌi/ as separate phonemes."

We may then propose that /ʌi/ and /a:i/ are now both part of the underlying vowel system for Scots/SSE. /a:i/ will still be marginal, but its inclusion in the underlying segment inventory is of some theoretical importance, since it both testifies to the lexical diffusion of SVLR, and marks a tenuous re-establishment of the length contrast in Scots/SSE. In varieties without consistently long low vowels, the introduction of underlying /a:i/ will provide the only evidence of a length contrast above the lexical level, and will therefore go some way towards guaranteeing that SVLR, as a lexical rule, obeys Structure Preservation. It remains to be seen whether SVLR will continue its diffusion through the other pairs of vowels, and perhaps effectively reverse itself by ultimately reintroducing a length contrast in all cases.

The account of the development of the SVLR given above can be seen to support Kiparsky's (1988) association of diffusing changes with lexical rules, and Neogrammarian changes with postlexical rules, given Harris's (1989) proviso that Neogrammarian/postlexical processes may develop diachronically into lexical rules, by full or partial phonologisation. SVLR also, to some extent, supports the notion of a life cycle of changes and rules, suggested by Harris's (1989, p.55) view that implementation as a postlexical rule; lexicalisation; and fossilisation, loss, and integration into the underlying representations reflect

> "different stages in the ageing process of sound change...whereby individual changes...percolate deeper and deeper into the linguistic system."

However, there are three differences between the cases of the SVLR and Harris's example of æ-Tensing.

- A lexical version of æ-Tensing is operative in some varieties, and a postlexical form in others; the earlier postlexical rule has consequently been fully lexicalised in dialects like Philadelphia and Belfast. However, SVLR represents only a partial phonologisation of the postlexical Low-Level Lengthening process, which remains productive even in the varieties which have also innovated SVLR.
- Harris (1989, p.54) tentatively proposes that, although a newly lexicalised rule may not be structure preserving, "the reassertion of Structure Preservation would then be predicted to dictate the direction of any subsequent change." Harris provides no clear evidence of such dictation, but the diffusion of SVLR, with the generalisation and incipient contrastivity of long [a:i], may be just such a case, since it is clear that the reintroduction of an underlying length contrast will

produce renewed conformity of SVLR with Structure Preservation. We might wish to propose that the principles and constraints of LP are in some sense both synchronically and diachronically 'real', since they not only control the structure of the synchronic phonology, but are also reasserted when disrupted by ongoing change.

- Harris's discussion implies that lexical rules cause changes in the underlying representations rather late in their life-cycles, as a result of increased opacity and as a concomitant of rule loss. However, SVLR has not entirely followed this course, since it caused a change in the underlying feature inventory, by neutralising the vowel length contrast in Scots/SSE, during its lexicalisation. This discrepancy suggests that we may be dealing with two variants of the sound change > rule > loss and phonemicisation pathway. One, outlined by Harris, would be characteristic of processes like æ-Tensing, which simply alter some feature value. The other would involve processes like SVLR, which neutralise some pre-existing feature contrast at the sound change stage. In this latter case, restructuring in the underlying representations may occur twice during the life-cycle of the process; once as for the first rule type, and once earlier, during the implementation of the change as a phonological rule. This development might be characteristic only of processes which, like the SVLR, are analysed in Standard Generative Phonology as involving rule inversion. This correlation may merit further investigation, as might a further and equally tentative suggestion that, in cases of the SVLR type, lexicalisation of the rule may take place partially in response to the alteration caused at the underlying level: rules causing changes in the underlying representations would then necessarily be lexical.

4. Historical Evidence for the Scots-Specific Nature of SVLR

The consideration of the introduction of SVLR in the previous section raises one final question. If we are to establish SVLR as a Scots-specific phonological rule, we must first challenge Agutter's contention that "the context-dependent vowel length encapsulated in SVLR is not and perhaps never was Scots-specific" (1988b, p.20). We have seen that SVLR can be defended synchronically as a Scots-specific process distinct from the pan-dialectal lengthening of vowels before voiced consonants and pre-pausally. I shall now discuss some evidence (cited in Harris 1985, Chapter 4) which suggests that SVLR was historically introduced only into Scots.

Harris discusses the chequered history of Middle English /ɛ:/, the vowel of the MEAT class of lexical items. This class, although intact at the beginning of the early Modern English period, had merged in standard dialects by the Eighteenth Century with the MEET class. Controversy exists, however, over whether the MEAT class earlier merged with the MATE class (< ME /a:/) before splitting and re-merging with ME /e:/ at /i:/ (Dobson 1957, Luick 1921). Harris believes that a consideration of some modern English dialects which retain a three-way contrast of MEET, MEAT and MATE words may shed further light on the dubious history of /ɛ:/; from our point of view, interest lies in the strategies which dialects of different areas have implemented to keep these classes of words, with ME /ɛ: e: a:/, distinct.

Lass (1976, p.71) proposes that a "no-collapse condition" was at work during the Great Vowel Shift, preventing vowels from merging after shifting. One instance where this constraint appears not to be operational involves the merger of ME /ɛ:/ and /e:/ (although admittedly this did not occur until very late in the sequence of GVS changes). However, although this merger took place in Standard English and Scots dialects, it did not occur completely generally; MEET-MEAT-MATE contrasts persist in many varieties of conservative Hiberno-English (Harris 1985, p.232), various rural English dialects (Wells 1982) and in some Scots dialects (Catford 1957). In such nonstandard varieties,

"we witness the results of the no-collapse constraint having remained in force while the vowels in question were in the process of merging in other dialects. It is instructive to examine the diverse ways in which the constraint has been implemented in these instances" (Harris 1985, p.234).

Harris discusses several strategies which dialects employ to preserve the MEET-MEAT-MATE system of contrasts. These include diphthongisation of vowels; the 'leapfrogging' of the reflex of ME /a:/ past that of /ɛ:/, resulting in a reversal of their previous relative heights; and the use of length contrasts. The redistribution of these possible strategies across English and Scots dialects indicates that

"the loss of phonemic vowel length in Scots has produced several developments quite different from anything else that has happened in England" (Harris 1985, p.251).

Harris considers five modern Scots dialects which keep their reflexes of ME /ɛ: e: a:/ distinct - those of north-east Angus, Kirkcudbright, east Fife, Shetland northern Isles/Yell/Unst, and Shetland mainland/Skerries. One of these, Kirkcudbright, is a 'core', central Scots dialect with full implementation of SVLR, so that /i e e̞/, the reflexes of ME /e: ɛ: a:/, are all positionally long or short. However,

"the other four dialect areas are typical of geographically peripheral areas of Scotland where

Aitken's Law has not gone to completion" (Harris 1985, p.254).

So, while the /i e/ reflexes of ME /e: ɛ:/ are subject to SVLR in these dialects, the reflexes of ME /a:/, which is /ɛ:/ in north-east Angus and Shetland northern Isles/Yell/Unst and /e:/ in east Fife and Shetland mainland/Skerries, are phonemically long.

The importance of SVLR, or rather, of its incomplete implementation in some areas, now becomes apparent; in east Fife and Shetland mainland/Skerries, the reflexes of ME /ɛ:/ and /a:/ are qualitatively identical. However, SVLR affects one vowel, /e/ < /ɛ:/, while phonemic length remains in /e:/ < /a:/. The length difference is, of course, neutralised in SVLR long contexts, but is sufficient to maintain the contrast elsewhere, as can be seen from (26).

(26)

SVLR context	ME /ɛ:/	ME /a:/
short	[met] 'meat'	[me:t] 'mate'
long	['e:ze] 'easy'	['le:ze] 'lazy'

(from Buckhaven, east Fife: Harris 1985, p.255)

The other three Scots dialects all differentiate ME /ɛ:/ from /a:/ qualitatively, as /e/ versus /ę/ in Kirkcudbright and /e/ versus /ɛ:/ in north-east Angus and Shetland northern Isles/Yell/Unst. The latter two dialects use conditioned versus phonemic length as an additional distinguishing strategy.

The significance of this dialect evidence for the status of SVLR becomes apparent when we compare the strategies employed in Scots dialects which maintain a three-way MEET-MEAT-MATE contrast with those used in comparable English dialects. Harris examines five English dialects with distinct reflexes of ME /e: ɛ: a:/ and shows that, in all of these, /ɛ:/ or /a:/ (or both) has diphthongised. In addition, some dialects preserve the original relative heights of these vowels, as is the case in Westmorland, with /iə/ < ME /ɛ:/ and /ea/ < ME

/a:/, while others reverse them; so, Devon and Cornwall has /ɛi/ < ME /ɛ:/ but /e:/ < ME /a:/. None of the English dialects uses vowel length differences to keep the MEAT-MATE distinction, since they all retain the reflexes of ME /e: ɛ: a:/ as phonemically long vowels or diphthongs and, in the absence of SVLR, there is no phonemic versus positionally determined length dichotomy. However, four out of the five Scottish dialects discussed by Harris maintain the MEAT-MATE distinction by exploiting the length difference created by the incomplete operation of SVLR, either as the sole distinguishing factor or along with the preservation of the relative vowel heights. The sole exception is Kirkcudbright, a 'core', central Scots dialect in which SVLR has been fully implemented and no phonemically long vowels remain. No Scottish dialect uses the strategy of diphthongisation; this is in keeping with the tendency of modern Scots and SSE long vowels to be realised as long steady-state monophthongs rather than sequences of vowel plus offglide.

It seems, then, that a difference in the status of vowel quantity between English and Scots dialects has led to the employment of distinct strategies in the two dialect areas in distinguishing the MEET-MEAT-MATE lexical sets. Whereas English dialects rely heavily on diphthongisation, Scots dialects tend to exploit the discrepancy between phonemic and contextually determined vowel length introduced in peripheral areas by SVLR. The fact that, in the English dialects concerned, all reflexes of ME /e: ɛ: a:/ surface synchronically as phonemically long monophthongs or as diphthongs, and the absence of the use of length differences to distinguish the reflexes of these vowels, lend support to the hypothesis that SVLR was introduced diachronically only into Scots.

Chapter 7

Summary

In this thesis, I have identified three areas of phonological theory, synchronic and diachronic, which were clearly mishandled in Standard Generative Phonology. These areas are potentially also problematic for Lexical Phonology, as a descendant of SGP within the generative paradigm.

The first of these problematic areas is the clear failure of SGP to curtail the possible abstractness of Underlying Representations and derivations in any principled way. This was arguably the most influential single factor in the downfall of SGP, and reactions against excessive abstractness have motivated the rejection of rule-based, derivational phonologies and transfer of attention to refinements of representation which are characteristic of a good deal of current phonological work. Lexical Phonology was initially intended (notably by Kiparsky) to form part of an attack on over-abstractness from within a derivational model, but the constraints suggested by Kiparsky (1982, 1985) and Mohanan (1986) have not been rigidly enforced, and recent work (especially Halle and Mohanan 1985) has incorporated a move back towards a degree of abstractness which had earlier attracted well-justified criticism.

The second problem to be faced is the tension between synchrony and diachrony which is characteristic of SGP. Although, on the one hand, synchronic derivations in SGP owe much (and perhaps too much) to diachronic developments, on the other hand, diachronic evidence is generally not regarded as admissible by generativists; there are generative analyses of sound change, but these stand outside the core of the theory and the link between sound changes and synchronic phonological rules is never adequately explored.

Our final difficulty is the contentious issue of the phonological treatment of dialects of the same language in a derivational phonology. The SGP view was that dialects share underlying representations, with any differences between them being encoded in the rules; different languages, on the other hand, have distinct underlying representations. However, this view is incompatible with the common characterisation of dialect and language variation as forming a continuum: if there is no natural way of encoding increasing inter-dialectal variation in the underlying representations, then diverging dialects cannot become distinct languages.

These three areas are all dealt with unsatisfactorily in SGP; moreover, these deficiencies can be shown to be linked, and to be due in all cases, directly or indirectly, to the insistence of proponents of the Standard Generative model on an exceptionless, maximally simple and general phonology. The use of an evaluation measure based on simplicity promotes the adoption of remote underlying representations and complex derivations, since these appear to capture most synchronic, internally motivated generalisations; excessive abstractness inevitably results. Changes in the rule system are generally preferred, in such a system, to changes in the underlying representations, so that rules simply build up as sound changes take effect, but the model is essentially static and there is no clear way of encoding profound consequences of change. This contributes to further abstractness, means that related dialects necessarily share common underlying forms, and restricts us to inadequate and unilluminating connections of synchrony and diachrony. The usual SGP decision to exclude diachronic material is said to reflect the fact that native speakers have no access to the history of their language, but is equally likely to be based on the fact that attempts to handle sound change in SGP were generally unsuccessful, and that the link between synchrony and diachrony in such a model is unclear.

The identification of these problems is clearly of some consequence for Lexical Phonology, which is a generative, derivational model and might therefore be expected to share the difficulties outlined above. This realisation might provoke one of two reactions. On the one hand, we might abandon derivational, rule-based phonology entirely, and transfer our energies to the development of monostratal, declarative phonological theory. On the other, we might decide that generative theory furnishes us with a number of insights which we would prefer not to lose (see here Bromberger and Halle, 1989), and attempt instead to find or produce a revised version of SGP, such as Lexical Phonology, in which these insights may be preserved, but the pervasive problems above solved.

The wholesale rejection of a partially problematic theory or construct is encountered fairly frequently in the history of linguistics; for instance, due to some well-known problems of rule duplication, the phoneme was dismissed entirely by Standard Generative Phonology, in favour of 'simpler' analyses which did not require a phonemic level. This rejection of the phoneme, however, has led to a number of difficulties in the characterisation of surface contrast in generative theory. It might have been preferable in that case, as in this, to recognise that many more insights may be lost by outright rejection than will be gained, and to attempt instead to integrate the favourable aspects of phonemic analysis, or derivational phonology, into a revised theory.

Lexical Phonology does indeed reintroduce a level of representation which shares many characteristics of a classical phonemic representation, in the form of the Lexical Level (Mohanan 1982, 1986); surface contrast can therefore be referred to directly in LP, and the Lexical

Level is assigned various psychologically relevant properties, in that it is seen as the representation on which speaker judgements on identity or difference of segments are based. The beneficial aspects of phonemic analysis are therefore reintroduced, but without the problems of the phoneme level, such as requirements of biuniqueness, linearity and so on, which had led to its rejection. The purpose of this thesis has been to show, using data from a number of varieties of English, that the insights provided by rule-based, generative phonology can likewise be preserved within Lexical Phonology. Furthermore, the problems detailed above can be solved within such a model, by rigorously applying the constraints of Lexical Phonology and by revising or replacing a number of the tenets of Standard Generative Phonology, and can therefore again be shown to be connected.

Chapter 1 began with a survey of the development of Lexical Phonology and Morphology, focussing on the early avowed intentions of proponents of the theory to restrict excessive abstractness, and to produce analyses consistent with both internal and external types of evidence. In Chapter 2, I attempted to constrain the model of LP proposed by Halle and Mohanan 1985, by restricting the lexical phonology to two levels, at least for English and perhaps universally, in line with recent work by Booij and Rubach (1987). In Chapter 3, attention shifted from the architecture of the model to the characteristics of specific phonological processes in the phonology of RP and GenAm. These proved to be constrainable given the application of principles like the Strict Cycle Condition, which can be imposed as a condition on the grammar, and other, more general anti-abstractness tactics, such as Mohanan's (1986) 'guiding principle' that underlying and lexical representations should be equivalent in the absence of alternations, which has effects similar to the SCC but is of wider application. The rigorous enforcement of these principles led to the abandonment of non-surfacing underliers, the recognition of underlying diphthongs in English, and far more concrete underlying vowel systems for the two varieties investigated, as well as substantially revised accounts of a number of processes, including the Vowel Shift Rule and j-Insertion. The resulting analyses and rules are more constrained than those of SGP and previous lexicalist analyses (Halle and Mohanan 1985), and reduce abstractness in the phonology. The rules proposed may also look quite radically different from their more familiar SGP formulations, and from their historical sources, as illustrated by the example of the Modern English Vowel Shift Rule. Furthermore, the revised analyses proposed in Chapters 2 and 3 were shown to be consistent with external evidence from a number of areas, including dialect differences, diachrony, speech errors and psycholinguistic experiments.

One consequence of these revisions is that the most rigorously constrained Lexical Phonology will not be equivalent to the 'ideal' SGP, so that adequacy can no longer be measured with reference to simplicity or to the number of rules and exceptions, but rather according to the closeness of fit of the proposed phonology with the suggested constraints. A certain degree of lexical marking, as for j-Insertion, and the presence of limited exceptions will be natural and unproblematic, and will in fact be expected, given that lexical rules in LP characteristically have lexical exceptions.

This proposal for the abandonment of the simplicity criterion is not new, and is not restricted to Lexical Phonology. A similar position is eloquently defended by Foley (1977, p.6), who contends that:

> "a fundamental philosophical error which transformationalists commit is their reliance on the

simplicity criterion. Since this criterion is part of the philosophical basis of transformational phonetics, the beneficity of the criterion is never questioned. To take a parallel situation, in planetary astronomy prior to Kepler, an important basic assumption was the circularity of planetary orbits. The correctness of this assumption was never questioned, for it was part of the philosophical (or theological) basis of astronomy. This assumption caused no end of difficulties, leading to ad hoc accretions in the form of epicycles on the cycles, and eventually epicycles on epicycles. The assumption of circular orbits was basically incorrect, and retarded planetary astronomy until Kepler replaced it with the assumption of elliptical orbits. Similarly in transformational phonetics, even though the simplicity criterion destroys any value the system might otherwise have, it is rigidly clung to, and never questioned. Yet it is a philosophical error....In brief, simplicity is not bad in itself; but simplicitism - the striving for simplicity - is, for in the hands of insensitive linguists it leads to premature closure, the quick and easy conclusion, which prevents further investigation which might discover some truth about language."

In other words, the abandonment of the simplicity criterion which seems to be required in a maximally constrained and concrete version of LP should not be seen as a difficulty, but as a step forward.

In Chapters 4 - 6 above, focus shifted from the purely synchronic matter of limiting abstractness, to the diachronic and dialectological consequences which follow from the adoption of a constrained Lexical Phonology. In Chapter 4, a third reference accent, Scottish Standard English, was introduced, since RP and GenAm are insufficiently dissimilar to allow conclusions on the existence and extent of underlying dialect variation to be adequately substantiated. The history of this accent and of the related Scots dialects, and their synchronic characteristics, were also outlined in Chapter 4. In Chapters 5 and 6, I concentrated on the synchrony and diachrony of a particular phonological process, the Scottish Vowel Length Rule, which is peculiar to Scots and SSE. SVLR was used to illustrate both the necessity of proposing underlying variation between related dialects, and the links of sound changes and phonological rules which become apparent, given a lexicalist model.

The conclusions of the second half of the thesis are as follows. First, given a constrained Lexical Phonology, it is reasonably easy to visualise changes at the underlying level, and this can be seen to depend only on the normal 'life-cycle' of sound changes and phonological rules, which will gradually penetrate deeper into the grammar across time, becoming eventually fossilised and unproductive. A portion of this development was illustrated using the Scottish Vowel Length Rule, which began as a postlexical rule and has become lexicalised in Scots and SSE. This type of development constitutes a partial solution to our second problem, the apparent tension of synchronic and diachronic factors, along with the presence of lexical exceptions to lexical rules, which may in fact constitute a valid mechanism for change; I have suggested that, if exceptions accrue, or the context for the rule becomes opaque, or the number of synchronic alternations falls significantly, the rule will cease to be a productive synchronic process and its effects will instead be integrated into the underlying representations. Dialect and language variation can therefore be regarded as a continuum, and dialect divergence can readily lead to language differentiation across time.

Furthermore, a constrained LP obliges us to at least admit of the possibility that related dialects will differ in their underlying forms; in fact, such underlying discrepancies may be relatively far-reaching, as was shown above for Scots and SSE as compared to RP and GenAm, since different features bifurcate the vowel system in the two sets of dialects, due to the innovation of SVLR in SSE and Scots. Intimately related dialects will probably only differ in their postlexical rules, but as they diverge they will acquire different lexical rules; a new lexical rule may have or acquire lexical exceptions, and across time these may multiply and cause loss of the rule and change in the underlying representations. It follows that the presence of exceptions should no longer be seen as a difficulty to be overcome; this was one of the errors of SGP. Instead, possession of lexical exceptions is simply one of the properties of the lexical syndrome, which determines the lexical character of rules, and which itself constitutes one of the motivations or mechanisms for further change and for progressive linguistic divergence.

The structure of LP also permits the easy characterisation of two types of sound change, the Neogrammarian and diffusing types. These have no analogues in SGP, but can be linked in Lexical Phonology with postlexical and lexical rules respectively. However, the boundary between these two types of changes and rules is not absolute, as was illustrated above using the example of the Scottish Vowel Length Rule; instead, lower-level rules may become lexical, in this case by the phonologisation of part of a postlexical lengthening schema which remains productive in Scots and SSE and in other varieties. A lexicalising rule will then set the agenda for future change in several ways. It may acquire lexical exceptions, perhaps by diffusing, and may then allow the development of changes at the underlying level and the ultimate divergence of related dialects, as detailed above. A newly lexicalised rule will also tend to acquire the properties of the lexical syndrome gradually rather than instantaneously. Specifically, such a rule may violate Structure Preservation, although such violation will be marked and temporary, and the future direction of change will ensure that Structure Preservation is again obeyed; thus, the current diffusion of the Scottish Vowel Length Rule seems to be producing renewed conformity with this principle. This provides further support for the reality of the constraints of Lexical Phonology, which characterise a non-abstract synchronic phonology but also seem to govern the structure of the grammar in a diachronic sense, in that temporary violations may be caused by ongoing change, but will gradually be brought back into line with these principles.

Our three initial problems seem, then, to be both resolvable and linked. A rigorous application of the constraints of Lexical Phonology provides a significantly less abstract synchronic phonology, which can be shown to be consistent with both internal and external evidence. Rules may move naturally from the postlexical to the lexical domain, and in doing so acquire properties which allow for further change. Underlying representations alter across time, so that related dialects may differ at the underlying level due to the historical innovation of distinct sets of lexical rules, and the synchronic form of a rule need not be equivalent to its form as a sound change. A concept of the transition of a sound change to a synchronic phonological rule can be established, and the two commonly recognised types of sound change can be matched with lexical and postlexical phonological rules.

Goyvaerts (1981, p.13), in assessing Standard Generative Phonology, concludes that

"the question remains...whether we should be striving after an elegant metaphysics or a perhaps not so elegant empirical theory."

I contend that a constrained Lexical Phonology of the type presented here can claim to be such an empirical theory, and that the rejection of elegance as a *sine qua non* of phonological theory, with the concomitant reduction of abstractness, leads to renewed coherence with internal and external evidence, and the revelation of illuminating connections between synchrony, diachrony, and variation.

Appendix 1
Derivations of Strong Verbs

In Chapter 3, it was noted that, although Halle and Mohanan (1985) claim to be able to derive the past and present tense forms of all modern English strong verbs (with the exception of the modals, the auxiliaries *do, be, have* and the main verbs *go, make, stand*) using a set of special rules, they provide no derivations illustrating the operation of these rules. The rules themselves, including x-Formation, and Backing, Lowering and Shortening Ablaut, were formulated in Chapter 3 above: in this Appendix, I provide derivations for all strong verbs mentioned in Halle and Mohanan's paper. Numbers in brackets before each derivation relate to the number of the verb list in which the relevant verbs appear in Halle and Mohanan (1985).

Derivations

(122a) *bereave - bereft;* also *cleave, creep, deal, dream, feel, keep, kneel, lean, leap, leave, mean, sleep, sweep, weep.*

	Pres.	*bereave*	Past
Underlying:		/bɛrēv/	
/t/-Suffixation:	--		bɛrēv]t
Cluster Shortening:	--		bɛrɛvt
Voicing Assimilation:	--		bɛrɛft
Vowel Shift:	bɛrīv		--
Diphthongisation:	bɛrīyv		--
Output:	[bɛriyv]		[bɛrɛft]

(122b) *bend - bent*; also *build, lend, rend*

	Pres.	*bend*	Past
Underlying:		/bɛnd/	
/t/-Suffixation:	--		bɛnd]t
Voicing Assimilation:	--		bɛntt
Degemination:	--		bɛnt
Output:	[bɛnd]		[bɛnt]

(122c) *bite - bit*; also *light, meet*

	Pres.	*bite*	Past
Underlying:		/bīt/	
/t/-Suffixation:	--		bīt]t
Cluster Shortening:	--		bɪtt
Degemination:	--		bɪt
VSR/Diphthongisation:	bāyt		---
Output:	[bāyt]		[bɪt]

(122d) *lose - lost*

	Pres.	*lose*	Past
Underlying:		/lōz/	
/t/-Suffixation:	--		lōz]t
Cluster Shortening:	--		lozt
Voicing Assimilation:	--		lost
VSR/Diphthongisation:	lūwz		--
o-Tensing:	--		lōst
o-Lowering:	--		lɔ̄st
Output:	[lūwz]		[lɔ̄st]

In RP, this verb will have to be marked [+ Lowering Ablaut], since the required output is [lɒst] rather than [lɔ̄st].

(122e) *seek - sought*; also *wreak, beseech, teach*

	Pres.	*seek*	Past
Underlying:		/sēk/	
/t/-Suffixation:	--		sēk]t
x-Formation:	--		sēxt
Cluster Shortening:	--		sɛxt
Backing Ablaut:	--		soxt
x-Deletion:	--		sot
VSR/Diphthongisation:	sīyk		---
o-Tensing:	--		sōt
o-Lowering:	--		sɔ̄t
Output:	[sīyk]		[sɔ̄t]

(126a) *hear - heard*; also *bleed, breed, feed, lead, plead, read*

	Pres.	*hear*	Past
Underlying:		/hēr/	
/d/-Suffixation:	--		hēr]d
Cluster Shortening:	--		hɛrd
VSR/Diphthongisation:	hīyr		--
Output:	[hīyr]		[hɛrd]

(126b) *hide - hid*; also *slide*

	Pres.	*hide*	Past
Underlying:		/hīd/	
/d/-Suffixation:	--		hīd]d
Cluster Shortening:	--		hIdd
Degemination:	--		hId
VSR/Diphthongisation:	hāyd		---
Output:	[hāyd]		[hId]

(126c) *sell - sold;* also *tell*

	Pres.	*sell*	Past
Underlying:		/sɛl/	
/d/-Suffixation:	--		sɛl]d
Backing Ablaut:	--		sold
o-Lengthening:	--		sōld
Output:	[sɛl]		[sōld]

(127a) *sit - sat;* also *spit, bid, drink, begin, ring, shrink, sing, sink, spring, stink, swim* (marked [- t/d suffixation])

	Pres.	*sit*	Past
Underlying:		/sIt/	
Lowering Ablaut:	--		sæt
Output:	[sIt]		[sæt]

(127b) *eat - ate* (marked [- t/d suffixation])

	Pres.	*eat*	Past
Underlying:		/ēt/	
Lowering Ablaut:	--		ǣt
VSR/Diphthongisation:	īyt		ēyt
Output:	[īyt]		[ēyt]

(127b) *lie - lay* (marked [- t/d suffixation])

	Pres.	*lie*	Past
Underlying:		/lī/	
Lowering Ablaut:	--		lǣ
VSR/Diphthongisation:	lāy		lēy
Output:	[lāy]		[lēy]

(127c) *choose* - *chose* (marked [- t/d suffixation])

	Pres.	*choose*	Past
Underlying:		/tʃōz/	
Lowering Ablaut:	--		tʃɔ̄z
VSR/Diphthongisation:	tʃūwz		tʃōwz
Output:	[tʃūwz]		[tʃōwz]

(129a) *cling* - *clung*; also *dig, fling, shrink, sling, slink, spin, spring, stick, sting, string, win, wring,* and past participle of *drink, begin, ring, sing, sink, spring, swim, stink* (marked [- t/d suffixation])

	Pres.	*cling*	Past
Underlying:		/klɪŋ/	
Backing Ablaut:	--		klɨŋ
ɨ-Lowering:	--		klʌŋ
Output:	[klɪŋ]		[klʌŋ]

(129b) *bind* - *bound*; also *find, grind, wind* (marked [- t/d suffixation])

	Pres.	*bind*	Past
Underlying:		/bīnd/	
Backing Ablaut:	--		bɨ̄nd
VSR/Diphthongisation:	bāynd		bāwnd
Output:	[bāynd]		[bāwnd]

(130a) *break* - *broke*; also *stave, wake* (marked [- t/d suffixation])

	Pres.	*break*	Past
Underlying:		/brǣk/	
Backing Ablaut:	--		brɔ̄k
VSR/Diphthongisation:	brēyk		brōwk
Output:	[brēyk]		[brōwk]

(130a) *get* - *got*; also *tread* (marked [- t/d suffixation])

	Pres.	*get*	Past
Underlying:		/gɛt/	
Backing Ablaut:	--		gɒt
Output:	[gɛt]		[gɒt]

(130b) *bear* - *bore*; also *swear, tear, wear* (marked [-t/d suffixation])

	Pres.	*bear*	Past
Underlying:		/bǣr/	
Backing Ablaut:	--		bɔ̄r
VSR/Diphthongisation:	bēyr		bōwr
Output:	[bēyr]		[bōwr]

(132a) *shoot* - *shot*

	Pres.	*shoot*	Past
Underlying:		/ʃōt/	
/t/-Suffixation:	--		ʃōt]t
Cluster Shortening:	--		ʃott
Degemination:	--		ʃot
Lowering Ablaut:	--		ʃɒt
VSR/Diphthongisation:	ʃūwt		---
Output:	[ʃūwt]		[ʃɒt]

(132b) *flee* - *fled*

	Pres.	*flee*	Past
Underlying:		/flē/	
/d/-Suffixation:	--		flē]d
Shortening Ablaut:	--		flɛd
VSR/Diphthongisation:	flīy		--
Output:	[flīy]		[flɛd]

(132c) *shoe* - *shod*

	Pres.	*shoe*	Past
Underlying:		/ʃō/	
/d/-Suffixation:	--		ʃō]d
Lowering Ablaut:	--		ʃɔ̄d
Shortening Ablaut:	--		ʃɒd
VSR/Diphthongisation:	ʃūw		---
Output:	[ʃūw]		[ʃɒd]

(132d) *see - saw* (marked [- t/d Suffixation)

	Pres.	*see*	Past
Underlying:		/s̄e/	
Backing Ablaut:	--		sō
Shortening Ablaut:	--		so
a/o-Tensing:	--		sō
o-Lowering:	--		sɔ̄
VSR/Diphthongisation:	sīy		--
Output:	[sīy]		[sɔ̄]

(134a) *bring - brought*; also *think*

	Pres.	*bring*	Past
Underlying:		/brIŋ/	
/t/-Suffixation:	--		brIŋ]t
Nasal deletion:	--		brIt
x-Formation:	--		brIxt
Lowering Ablaut:	--		bræxt
Backing Ablaut:	--		broxt
x-Deletion:	--		brot
o-Tensing:	--		brōt
o-Lowering:	--		brɔ̄t
Output:	[brIŋ]		[brɔ̄t]

(134b) *buy - bought*

	Pres.	*buy*	Past
Underlying:		/bīx/	
/t/-Suffixation:	--		bīx]t
Cluster Shortening:	--		bIxt
Lowering Ablaut:	--		bæxt
Backing Ablaut:	--		boxt
VSR/Diphthongisation:	bāyx		--
x-Deletion:	bāy		bot
o-Tensing:	---		bōt
o-Lowering:	---		bɔ̄t
Output:	[bāy]		[bɔ̄t]

(134b) *fight - fought*

	Pres.	*fight*	Past
Underlying:		/fīxt/	
/t/-Suffixation:	--		fīxt]t
Cluster Shortening:	--		fIxtt
Degemination:	--		fIxt
Lowering Ablaut:	--		fæxt
Backing Ablaut:	--		foxt
VSR/Diphthongisation:	fāyxt		--
x-Deletion:	fāyt		fot
o-Tensing:	--		fōt
o-Lowering:	--		fɔ̄t
Output:	[fāyt]		[fɔ̄t]

(139) *drive - driven - drove*; also *ride, rise, shrive, smite, strive, write* (marked [- t/d suffixation])

	drive	*driven*	*drove*
Underlying:	/ī/	/ī/	/ī/
Lowering Ablaut:	-	-	ǣ
Backing Ablaut:	-	-	ɔ̄
Shortening Ablaut:	-	I	-
VSR/Diphthongisation:	āy	-	ōw
Output:	[drāyv]	[drIvən]	[drōwv]

(141a) *cleave - clove*; also *freeze, heave, speak, steal, weave* (marked [- t/d suffixation])

	Pres.	*freeze*	Past
Underlying:		/frēz/	
Lowering Ablaut:	--		frǣz
Backing Ablaut:	--		frɔ̄z
VSR/Diphthongisation:	frīyz		frōwz
Output:	[frīyz]		[frōwz]

(141b) *bide - bode*; also *dive, shine, stride* (note that *dive* and *shine* do not form part of this set in British English) (marked [- t/d suffixation])

	Pres.	*bide*	Past
Underlying:		/bīd/	
Lowering Ablaut:	--		bǣd
Backing Ablaut:	--		bɔ̄d
VSR/Diphthongisation:	bāyd		bōwd
Output:	[bāyd]		[bōwd]

(142) *fly - flew* (marked [- t/d suffixation])

	Pres.	*fly*	Past
Underlying:		/flī/	
Backing Ablaut:	--		flɨ̄
Shortening Ablaut:	--		flɨ
VSR/Diphthongisation:	flāy		--
ɨ-Rounding/Lengthening:	--		flūw
Output:	[flāy]		[flūw]

(142) *strike - struck* (marked [- t/d suffixation])

	Pres.	*strike*	Past
Underlying:		/strīk/	
Backing Ablaut:	--		strɨ̄k
Shortening Ablaut:	--		strɨk
ɨ-Lowering:	--		strʌk
VSR/Diphthongisation:	strāyk		---
Output:	[strāyk]		[strʌk]

(143) *fall - fallen - fell* (marked [- t/d Suffixation])

	fall/fallen	*fell*
Underlying:	/ɛ/	/ɛ/
Backing Ablaut:	fol	--
a/o Tensing:	fōl	--
o-Lowering:	fɔ̄l	--
Output:	[fɔ̄l]	[fɛl]

(145) *hold - held* (marked [- t/d suffixation])

	Pres.	*hold*	Past
Underlying:		/hɛld/	
Backing Ablaut:	hold		--
o-Lengthening:	hōld		--
Diphthongisation:	hōwld		--
Output:	[hōwld]		[hɛld]

Note that, although this is the derivation suggested by Halle and Mohanan, the output [hōwld] is actually underivable, given that HM order Diphthongisation before postlexical o-Lengthening.

(146) *forsake* - *forsook*; also *shake*, *take* (marked [- t/d suffixation])

	Pres.	*take*	Past
Underlying:		/tēk/	
Lowering Ablaut:	tǣk		--
Backing Ablaut:	--		tōk
VSR/Diphthongisation:	tēyk		tūwk
u-Shortening:	--		tʊk
Output:	[tēyk]		[tʊk]

(149a) *run* - *ran* (marked [- t/d suffixation])

	Pres.	*run*	Past
Underlying:		/rIn/	
Lowering Ablaut:	--		ræn
Backing Ablaut:	rɨn		---
ɨ-Lowering:	rʌn		---
Output:	[rʌn]		[ræn]

(149b) *come* - *came* (marked [- t/d suffixation])

	Pres.	*come*	Past
Underlying:		/kīm/	
Lowering Ablaut:	--		kǣm
Backing Ablaut:	kɨ̄m		---
Shortening Ablaut:	kɨm		---
ɨ-Lowering:	kʌm		---
VSR/Diphthongisation:	---		kēym
Output:	[kʌm]		[kēym]

(149c) *give* - *gave* (marked [- t/d suffixation])

	Pres.	*give*	Past
Underlying:		/gīv/	
Lowering Ablaut:	--		gǣv
Shortening Ablaut:	gIv		---
VSR/Diphthongisation:	---		gēyv
Output:	[gIv]		[gēyv]

(149d) *slay* - *slew* (marked [- t/d suffixation])

	Pres.	*slay*	Past
Underlying:		/slī/	
Lowering Ablaut:	slǣ		--
Backing Ablaut:	---		slɨ̄
Shortening Ablaut:	---		slɪ
VSR/Diphthongisation:	slēy		---
ɨ-Lengthening:	---		slɨ̄
ɨ-Rounding:	---		slūw
Output:	[slēy]		[slūw]

(149e) *catch* - *caught*

	Pres.	*catch*	Past
Underlying:		/kɛtʃ/	
Lowering Ablaut:	kætʃ		--
/t/-Suffixation:	--		kɛtʃ]t
x-Formation:	--		kɛxt
Backing Ablaut:	--		koxt
x-Deletion:	--		kot
o-Tensing:	--		kōt
o-Lowering:	--		kɔ̄t
Output:	[kætʃ]		[kɔ̄t]

(150) *say* - *said*

	Pres.	*say*	Past
Underlying:		/sē/	
/d/-Suffixation:	--		se]d
Lowering Ablaut:	sǣ		--
Shortening Ablaut:	--		sɛd
VSR/Diphthongisation:	sēy		---
Output:	[sēy]		[sɛd]

(151a) *blow* - *blew*; also *crow, grew, throw, know* (marked [- t/d suffixation])

	Pres.	*blow*	Past
Underlying:		/blī/	
Lowering Ablaut:	blǣ		--
Backing Ablaut:	blɔ̄		blɨ̄
Shortening Ablaut:	---		blɨ
ɨ-Lengthening:	---		blɨ̄
ɨ-Rounding:	---		blū
VSR/Diphthongisation:	blōw		blūw
Output:	[blōw]		[blūw]

(151b) *draw* - *drew* (marked [- t/d suffixation])

	Pres.	*draw*	Past
Underlying:		/drIx/	
Lowering Ablaut:	drɛx		--
Backing Ablaut:	drox		drɨx
x-Deletion:	dro		drɨ
ɨ-Lengthening:	---		drɨ̄
ɨ-Rounding:	---		drū
Diphthongisation:	---		drūw
a/o Tensing:	drō		--
o-Lowering:	drɔ̄		--
Output:	[drɔ̄]		[drūw]

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