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1 *A requiem for Lexical Phonology?*

Shortly after the appearance of the first main-stream book on Lexical Phonology (Mohanan 1986), Gussmann published an incisive and detailed review (1988), which – as is strangely more apparent now than it was then – captured the mood of the time. In it, he attacked not just the book under review but the entire programme of Lexical Phonology, meticulously dismantling Mohanan (1986) chapter by chapter and concluding: 'If the critical assessment of lexicalism presented here and elsewhere were to be accepted, then Mohanan's book would very likely come to stand as a requiem for Lexical Phonology' (Gussmann 1988: 239). As at that time phonologists were beginning to abandon in droves not only derivationalist theories but also English – one of Mohanan's main concerns – Gussmann's review could not have come at a better time for some, and at a worse time for others. Such was the mood of the time.

The title of Mohanan (1986), *The theory of lexical phonology*, misleadingly suggested that the book reported, and indeed was, the state-of-the-art. It wasn't anything like that; but the misled reviewer can be forgiven for responding in kind. Mohanan (1986) was an easy target not only for a reviewer hostile to the programme but, perhaps even more so, for the theory-internal and therefore constructively minded critic. To Gussmann's credit, most of his comments could have come from either quarter: those who had been doing independent and, at least in part, rather differently focused work on this framework, shared Gussmann's disagreement with many of the points made by Mohanan; see, for example, the contributions to Hargus and Kaisse (1993) and Wiese (1994). I return to those points below. But anyone who interprets Mohanan (1986) as the requiem for Lexical Phonology envisaged by Gussmann may as well regard Chomsky and Halle (1968, henceforth 'SPE') as the swan-song of phonology in the generative enterprise, which it clearly was not although its deep flaws became apparent as quickly as did Mohanan's after its publication. And anyone who does either or both will have a problem assessing the progress made in phonological theory since.

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Of course we know now that neither Gussmann nor Mohanan did finish off the theory of Lexical Phonology. But Gussmann's critique inflicted such damage, to the work's standing if not to the programme's, because it highlighted major structural weaknesses rather than just bad analyses. Here is an example.

> The failure of the Lexical Phonology seems in no small measure to have been due to the superficial or impoverished view of morphology that it resorted to. . . . There is the whole area of conditions on rules and rule interactions within morphology, of blocking, of the semantics of derivatives, of . . . morpheme vs. word-based models, etc. (Gussmann 1988: 238)

It would have been useful there to draw a distinction between the programme itself and its practitioner. Progress had been made particularly in this area by Kiparsky (1982) and others; but there is indeed little trace of it in Mohanan (1986), who – admittedly, like many others – tends to treat the short name of the programme, Lexical Phonology, in its literal sense.

'Lexical Phonology' is of course a misnomer in that it refers only to half of the story. The programme's central hypothesis is that '[m]orphology and phonology apply in tandem' (Booij 1994: 3). This tandem application is subject to the sub-theory of 'level-ordering' or 'lexical stratification', whereby morphology and phonology interact in a series of ordered 'levels' or 'strata'.[1] But there were, and still are, the questions of just how many strata are needed, what they contain, whether they are universal and – most importantly – why. Here are the morphological sides of two competing models of the 1980s:

(1)

	Kiparsky (1982)	Halle and Mohanan (1985) Mohanan (1986)
Stratum 1	'+'-affixation: *-ity*, *-ic*, irregular inflexion: *cacti*, *oxen*	'+'-affixation: *-ity*, *-ic*, irregular inflexion: *cacti*, *oxen*
Stratum 2	'#'-affixation: *-ness*, *-less*, compounding	'#'-affixation: *-ness*, *-less*
Stratum 3	regular inflexion	compounding
Stratum 4	—	regular inflexion

The stratal split between '#'-affixation and compounding is in Mohanan's model motivated by a single phonological rule of rather dubious status;[2] on the morphological side it gives rise to the now-infamous 'loop': given that '#'-affixation and compounding freely interact (*rule-*

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governedness, *to re-aircondition* etc.; Kiparsky 1982), Mohanan is forced to allow the morphology recourse to the previous stratum while maintaining the split for the phonology. This loop – 'a noose for Lexical Phonology' (Gussmann 1988: 237) – weakens the theory beyond recognition: effectively, the theory's central hypothesis of morphology–phonology interaction is abandoned. As Kiparsky's (1982) three-strata model similarly needed a loop to account for regular inflexion occurring inside compounds (*systems analyst*, *drinks dispenser* etc.; Sproat 1985), two-strata models are now standard in the literature on English (Kiparsky 1985; Booij and Rubach 1987; McMahon 1990; Borowsky 1993), albeit in rather different versions. But the question of why this should be so remains unanswered.

The two models of stratification given in (1) above are 'affix-driven': the morphology of a given stratum is defined by the sum of affixes that are diacritically marked for attaching on it. (The morpheme and word boundary symbols '+' and '#' (respectively), introduced by SPE but replaced by brackets in Lexical Phonology, serve here merely to express this diacritic marking.) The problem with such models is that a number of (English) affixes display morphological and phonological behaviour that is consistent with both strata. And the 'Affix Ordering Generalisation' (Selkirk 1982b), whereby crucially no '#'-affix can occur inside a '+'-affixed form, appears in many cases not to hold. But in the literature

> . . . counter-examples of affix ordering (Aronoff 1976) tended to be dismissed or explained away. However, the number of such counter-examples has turned out to be too large to be dismissed (Aronoff and Sridhar 1983). The ordering of levels (strata) as a replacement for the SPE boundaries came to be seen as not very desirable, 'in large part because of the lack of control over the number of levels' (Aronoff and Sridhar 1983: 10). (Gussmann 1988: 237)

Some ten years on, the literature on lexical stratification records no progress on this issue, damaging to the theory though it is.

This is not the place (and no longer the time) to launch another review of Mohanan (1986) or to re-launch Gussmann's. My point is that it was as premature then as it is now to talk of nooses and requiems: Mohanan (1986) is a mere example of an unfinished agenda. But before I outline how the present contribution to Lexical Phonology is intended to advance the agenda (if not to finish it), let us briefly consider the phonological side of the theory.

I am not so much concerned here with individual phonological rules as I am with constraints on rules and the long-standing attempt at limiting the

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abstractness of phonological derivations. This is another area in which Lexical Phonology had promised, and indeed made, progress well before Mohanan (1986). Once again it is progress ignored by Mohanan; and curiously it is a major weakness of that work that is missed in Gussmann's critique. This progress largely concerned the status of the Strict Cycle Condition (Kean 1974; Mascaró 1976), which confines structure-changing cyclic rules to derived environments, with regard to lexical stratification (Kiparsky 1982). But rather than devising a phonology in such a way as to make it comply with that condition, Mohanan (1986) and most other researchers in the field (notably Halle and Mohanan 1985) devised points in the derivation at which rules would be exempt from the condition. Their Stratum 2 is non-cyclic by stipulation, for the single purpose of providing a safe haven for unconstrained rules of Vowel Shift, Vowel Reduction and others. A large part of SPE's rule apparatus, with all its abstractness problems – free rides, indeterminate underliers, never-surfacing feature combinations, etc. – simply re-appeared in Lexical Phonology as if the abstractness debate in Generative Phonology had never happened. And curiously, little further progress has been made since, except that the notion of structure-changing rules itself has increasingly been abandoned in derivationalist theories (Archangeli 1988; Kiparsky 1993), driven in part by what may well be viewed as misplaced pessimism regarding the constrainability of structure-changing devices (McMahon 1992).

I intend to show in this study that the hypothesis of affix-driven stratification cannot be sustained: this hypothesis fails on a larger scale than has been recognised even by its fiercest critics (for example Szpyra 1989). In its place I formulate a theory of 'base-driven' stratification (first sketched in Giegerich 1994a), which defines strata by reference not to affixes but to affixation bases (where affixes are in principle free to attach on more than one stratum). I show that English, which recognises the morphological categories 'root' and 'word' (Selkirk 1982b), has two lexical strata while German has three (Wiese 1996): root, stem and word-based respectively. Base-driven stratification exercises full control over the number of strata in a given language, but it makes rather fewer predictions than did its predecessor model regarding the stratum or strata on which a given base form can attract a given affix. The Affix Ordering Generalisation, with all its problems, loses its crucial diagnostic status in determining the stratal affiliation of affixes. For stratum 1, I abandon the notion of affixation 'rules' and propose a framework in which affixed forms are listed, thus accommodating the semantic idiosyncrasy, lack of productivity and morphological

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Excerpt
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blocking that characterise stratum-1 formations (Kiparsky 1982, S. Anderson 1992). I show that this framework is an automatic consequence of base-driven stratification.

Turning to the phonological side of the theory, I show that base-driven stratification predicts the Strict Cyclicity Effect on all non-final lexical strata (Giegerich 1988): only on the last lexical stratum can structure-changing phonological rules affect underived environments. There, however, the Alternation Condition exerts diachronic pressure on structure-changing rules to move onto earlier strata and commonly to undergo rule inversion (Vennemann 1972b). A relevant example of (partial) inversion is the synchronic rule of Vowel Shift (McMahon 1990); the present study formulates the principles governing this phenomenon, and looks at further examples.

One striking case is the alternation of full and central vowels found in pairs such as *atom – atomic*, *totem – totemic*; *occur – occurrence*, *deter – deterrent* (in Received Pronunciation, 'RP'). In the present framework, such alternations cannot be due to the operation of a synchronic rule of Vowel Reduction: their underlying representations cannot contain full vowels. It follows that such alternations can only be driven by orthographic information (if they are predictable at all): in an adequately constrained derivational framework, such cases breach the limit of what can be predicted on phonological grounds alone. It follows, as I argued also in Giegerich (1992c, 1994b), that there must be rather more to orthographic representations than linguistic theory (notably SPE) has hitherto recognised. In more general terms, the theory makes point-blank predictions as to which alternations are of a phonological (and hence automatic) nature, and which are not.

The theme of rule inversion re-emerges in my treatment of [r]-sandhi. There I argue that the 'standard' generative account, which assumed synchronic breaking and /r/-deletion in cases such as *hear*, is inadequate on both empirical and formal grounds. But the inverse [r]-insertion account is also unsatisfactory. I propose instead an analysis that treats [r] and schwa, in non-rhotic varieties of English, as 'allophones' of the same underlying segment: [r]-sandhi is the result of a (partial) autosegmental re-alignment of the schwa melody. This implies that the low vowels, [ɑː] and [ɔː], must be underlying centring diphthongs in modern RP as they were, even in surface terms, at the turn of the century (Sweet 1908). What we witness there is 'rule inversion in progress': I shall argue, in more detail than in Giegerich (1997), that London English now has monophthongal underliers for the long low

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vowels while the (mainstream) RP inventory has not (yet?) been so re-structured. And again we shall see that relevant vowel alternations (such as those of the type (RP) *abhor – abhorrent – abhorring*, *deter – deterrent – deterring*) are predicted by base-driven stratification.

The book concludes with a study of syllabification in base-driven stratification. I argue there against re-syllabification rules of the form proposed – 'slip-shod at best': Gussmann (1988: 234) – by Mohanan (1986) and much of the later literature. Syllabification is structure-building throughout the lexical derivation; and syllabicity alternations such as *rhythm – rhythmic*, *metre – metric – metering* are once again the automatic effect of base-driven stratification. In fact, cases like that and their German equivalents provide independent support for the stratification theory that constitutes the main theme of this work.

Indeed, this work is concerned with the single issue of base-driven stratification and the analyses facilitated by that theory. Other issues – the format of phonological 'rules' and even the validity of such devices in phonological theory – play no part: that would have been a different agenda. I also do not attempt a complete account of the segmental phonology of English: on this – with more critique of, and reference to, Halle and Mohanan (1985) and Mohanan (1986) – see McMahon (forthcoming).

At least in 1986 the requiem seems to have been some way off.

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2 *Affix-driven stratification: the grand illusion*

2.1 The origins

Let us assume that the English lexicon is divided into two strata. This is not only the position that appears to have met with broad consensus in recent research; it will also be extensively argued for in later chapters. Moreover, it happens to be the position most closely associated with Siegel's (1974) original observations and claims, which were to prove seminal to the framework while in turn harking back at least to SPE. Such origins are worth investigating, especially when – as we shall see – they are also the origins of a major flaw in most current stratification models.

At the root of the two-strata model lies the familiar generalisation, dating back to SPE and beyond (for example Bloomfield 1933), and related to the more general 'close-juncture' vs. 'open-juncture' distinction found in the American structuralist tradition (for example Trager and Smith 1951), that the derivational morphology of English has two types of affixation processes, distinguished from each other empirically by a syndrome of differences in terms of morphological and phonological behaviour that will be discussed in some detail below. The well-known 'stress-shifting' vs. 'stress-neutral' effect on the affixation base is one such difference in behaviour. In formal terms, SPE expresses the distinction by associating affixes with different boundary symbols, '#' and '+', where the former 'word boundary' serves, among other things, to block the cyclic application of stress rules – #-affixes therefore lie outwith the domain of the stress rules, their presence having no effect on the stress pattern of the base – while the latter 'morpheme boundary' does not block the cyclic (re-)application of stress rules. Witness the stress shifts caused by the addition of +-affixes in *átom – atóm+ic – àtom+ìc+ity*, and the absence of such shifts in *átom – átom#less – átom#less#ness*.

Siegel (1974) contributes the following claims/generalisations to the analysis of the behaviour of the two types of affixation. First, she claims

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that (with few exceptions) every affix is firmly associated with one (and only one) of the two boundaries. SPE, although implying the same but of course essentially unconcerned with issues morphological, had been less strongly committed to this claim. But SPE does say that '[#-affixes] . . . are assigned to a word by a grammatical transformation, whereas the affixes that determine stress placement are . . . *internal to the lexicon*' (SPE: 86; my emphasis).

While this distinction has been superseded by the Lexicalist Hypothesis (N. Chomsky 1970b) and its aftermath, in which the transformational approach to word formation has been abandoned, its motivation is, nevertheless, worth bearing in mind. We shall in fact see in this chapter and the next that behind this distinction lies an important insight regarding systematic differences in the format of affixation processes, and one that has been lost in the early versions of the theory of Lexical Phonology and Morphology, where all affixes were held to be assigned to their bases, in the lexicon, by rule.

Second, Siegel argues that the two classes of affixes thus emerging (+-affixes are 'Class I' and #-affixes 'Class II') are attached under extrinsic ordering such that all Class I affixes are attached before, and all Class II affixes after the operation of the stress rules. This accounts for the two affix classes' different attitudes towards the stress patterns of their bases, as well as rendering the boundary distinction redundant (Strauss 1979, 1982).[1] And from this ordering follows, third, the morphological prediction that no Class II affix can occur inside a Class-I formation: while *atom-less*$_{\text{II}}$*-ness*$_{\text{II}}$ and *atom-ic*$_{\text{I}}$*-ity*$_{\text{I}}$ are well formed, **atom-less*$_{\text{II}}$*-ity*$_{\text{I}}$ is not. Since Selkirk (1982b) this prediction has been known as the Affix Ordering Generalisation (henceforth 'AOG'). But the question of whether this is a significant generalisation about English, or merely a less-than-fully substantiated claim, has never been settled although ample doubt has been cast (Aronoff and Sridhar 1983; Szpyra 1989; Wójcicki 1995). Nor has it been entirely clear whether the ill-formedness of items like **atomlessity* is really due to the stratification-induced AOG or to other constraints within the morphological system. I shall discuss this issue further in Section 2.2.1, and the more general voices of dissent later in this chapter.

In the evolution of the theory of morphology–phonology interaction, the step from Siegel's original claims to a stratified lexicon was only a minor one. The mechanical foundations had been laid by Siegel; the recognition that the lexicon was the site of such interaction, in the wake of N. Chomsky's (1970b) Lexicalist Hypothesis, was all that was needed to estab-

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lish the lexicon as a stratified module of the grammar. Stratum 1 comprises the morphology defined by Siegel as Class I (+-level affixation) as well as cyclic phonological rules, among the latter the rules of stress, Trisyllabic Shortening (*nation – national*), etc. On stratum 2 are located the morphology involving (among other things) Siegel's Class-II (#-level) affixes as well as the remainder of the lexical phonological rules. Boundary symbols are replaced by morphological brackets. To prevent bracket-sensitive phonological rules of stratum 2 from being triggered by brackets introduced on stratum 1, the Bracket Erasure Convention stipulates the deletion of all but the outermost brackets at the end of each stratum (Mohanan 1986: 29 ff.). Hence the stratum-2 rule of *mn*-Simplification (to be discussed further in Section 4.3.3), which deletes the pre-bracket [n] in the stratum-2 formation *damn***]***ing* (as well as in the morphologically simple form *damn***]**), is prevented from affecting the stratum-1 form *damnation*: the internal bracket following the *mn*-sequence is no longer present at the point of the rule's operation. Bracket Erasure moreover serves to prevent the postlexical phonology from having access to word-internal (morphological) structure.

SPE's boundary symbolism had actually been more sophisticated than that. In addition to the '+'/'#' distinction among affixed constructions, that model had posited '##' within compounds (hence *atom#less* vs. *atom##bomb*).[2] In a lexical phonology/morphology, this distinction can be expressed in terms of brackets. Kiparsky (1982) proposes the following bracketing conventions: roots and words are represented as '**[**X**]**', prefixes as '**[**Y' and suffixes as 'Z**]**'. If this proposal is adopted (as it has been, widely, in the literature) then **[[***atom***]***less***]]** is structurally distinct from **[[***atom***][***bomb***]]**. Phonological differences between suffixations and compounds (e.g. syllabification differences: compare *popping* and *pop art*) are taken care of by the presence or absence of an initial bracket '**[**'; and, given that on the morphological side compounding and stratum-2 suffixation freely interact (as in *brightness measure* vs. *rule-governedness*) (Kiparsky 1982), SPE's '##' boundary need not be encoded in terms of an additional stratum in a stratified lexicon. The separate stratum for compounding, proposed by Halle and Mohanan (1985) and Mohanan (1986), can be abandoned, and with it the infamous 'loop' back into the previous stratum that that model had required recourse to. What had necessitated the third stratum in those authors' model had been the assumption that all morphemes – roots, words and affixes alike – are identically bracketed as **[**X**]** (Mohanan 1986: 127ff., 143 f.). Under such a bracketing convention, compounds are nondistinct from prefix- and suffix-derivations; a stratal distinction between affixation

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and compounding was hence needed in that model in order to express (for example) syllabification differences such as the one noted above. Further arguments have been put forward against Kiparsky's (1982) split between Class-II affixation/compounding (his stratum 2) and regular inflection (his stratum 3) (Sproat 1985; Booij and Rubach 1987), which brings the number of recognised strata in English down to two.

The current view on the stratification of the English lexicon, then, not only has its intellectual roots in the '+' vs. '#(#)' boundary distinction of SPE and Siegel (1974); it also continues to rely crucially on the original assumptions behind that particular distinction. It does so in two respects. First: the only stratal split in the English lexicon that has stood up to closer scrutiny has been the one that corresponds to the original '+/#' distinction. There are two strata, ordering SPE/Siegel's +-level affixation (and associated phonological rules) before the unstructured rest of the morphology (and associated phonology). Second, and more problematically, that stratal split is a direct descendant of Siegel's claim that there are +-affixes and #-affixes – that, in other words, the information regarding the stratal siting of a given morphological process is exclusively and comprehensively encoded in the affix involved, and not for example in the base of the process. This encoding is essentially diacritic: just as the distribution of boundaries among affixes was essentially *ad hoc* – dictated by individual behaviour rather than derived from more general principles – in the SPE framework, so is the association of affixes with strata in the lexical framework. The morphological side of a given stratum (and, thereby, the stratum itself) is crucially defined by the range of affixes that attach on it. Only in that way can the continued reliance on Siegel's AOG in arguments about lexical stratification be explained. (See for example, Kiparsky (1982, 1985); Halle and Mohanan (1985); Mohanan (1986); as well as textbook accounts such as Spencer (1991); Carstairs-McCarthy (1992); Katamba (1993).) Again, then, the definition of strata relies on the diacritic information lodged with each affix. If the assumption that every affix is diacritically marked for either stratum 1 (= '+') or stratum 2 (= '#') turns out to be false then such an affix-driven stratification model faces trouble whose seriousness increases with the number of affixes that are found to violate the AOG and/or to operate on both strata. I return to this issue below, noting here merely that it would be hardly surprising if such comprehensive and unambiguous (but entirely arbitrary) diacritic marking of affixes were found to be unstable in a natural language, both in diachronic and in synchronic terms.

Siegel (1974) does identify a generalisation regarding the nature of the

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