On the Motivation for an Evolutionary Typology of Sound-Structural Rules

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Linguistics

by

Richard David Janda

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1987
DEDICATION

This dissertation is dedicated:

with thanks to all who waited and helped, and--more particularly--

with love to my wife, Brenda Jo Bellonger, and to my stepsons, Christopher Allen Peterson and Andre George Barthelemy;

in honor of my parents, Patricia Elise De Burn Janda and Robert James Janda, and of my sisters, Kathryn Elise Janda and Judith Ellen Janda Ellis;

in memory of my grandparents-- Wilhemina (Minnie) Frances Engelthaler Janda and James Frank (Vaclav František) Janda, Raynor De Burn and Constance Muriel Shaw De Burn--

and with indebtedness for the example of their lives to two linguists who, as respectively teacher and colleague, shared lessons about both language and life that deserve to be passed on to others: Dora Schulz (1905/1906[?] - 1974), who knew how to fill every one of her nearly 70 long years with scholarship, good-heartedness, and enthusiasm, and, even more fondly, Adrian Akmajian (1934-1983), who showed how to pack just as much linguistics, friendship, and vitality into a lifespan unfairly cut short at 38:

"Swes leben ich lobe, des töt den wil ich ie mer klagen."
'Whose life I praise, his/her death I will always lament.'

--Walther von der Vogelweide (ca. 1170 - ca. 1230)

[Written 1225 as the first line of a poem numbered 85,9 by Lachmann; see Walther von der Vogelweide [ca. 1188-1228]/Böhm 1955^2:243 et passim.]
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# VITA

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>September 29, 1954</td>
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<td>1973</td>
<td>Fairclough Prize for Superior Work in the Department of Classics, Stanford University</td>
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<td>1974-1975</td>
<td>Rheinische Friedrich-Wilhelms-Universität Bonn, Federal Republic of Germany</td>
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<td>Freie Universität Berlin, West Berlin, Federal Republic of Germany (Kleine Matrikel) Phi Beta Kappa, Stanford University</td>
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<td>1976</td>
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<td>B.A. (with distinction) in Human Language, Stanford University</td>
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<td>1977-1981</td>
<td>Chancellor's Intern Fellowship, University of California, Los Angeles</td>
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<td>Graduate Student Prize, Robert B. Campbell Book Collection Competition, University of California, Los Angeles</td>
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<td>Bernard and Julia Bloch Memorial Fellowship, Linguistic Society of America (LSA) Linguistic Institute, Salzburg, Austria</td>
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<td>Distinguished Teaching Assistant Award, University of California, Los Angeles</td>
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PUBLICATIONS AND PRESENTATIONS

As of June, 1987, Richard David Janda had had published or accepted for publication 21 papers, 5 short discussions, reviews, and squibs, and 17 abstracts. He had also already made or was scheduled to make 34 conference-paper presentations, 23 other professional presentations, and 3 community public-service presentations. (Nineteen of these publications and/or presentations--some of them joint--are cited as part of the References in the present work.)
ABSTRACT OF THE DISSERTATION

On the Motivation for an Evolutionary Typology of Sound-Structural Rules

by

Richard David Janda
Doctor of Philosophy in Linguistics
University of California, Los Angeles, 1987
Professor Stephen R. Anderson, Chair

"Sound-structure"—those aspects of language which, unlike syntax, semantics, and pragmatics, crucially involve sound—is traditionally divided into phonetics, phonology, morphology, and lexicon, while historical transitions across those domains have also long been discussed. This work assesses the evidence motivating a parallel distinction among types of sound-structural rules and a set of diachronic links between them—which together constitute an "evolutionary rule-typology" of sound structure.

Part One addresses the general motivation for the rule types. Chapter I suggests that a sound-structural typology can properly constrain both phonology and morphology by avoiding the common "morphologically conditioned phonological rules" which blur the distinction between phonological and "morpholexical" (i.e., morphological and "lexical-correspondence") rules; such processes here find a natural place in "process morphology". Chapter II reviews the antecedents of the current evolutionary rule-typology
and shows how that construct best constrains the notion "possible sound-pattern of a human language".

Part Two presents the specifics of the typology and the evidence supporting it. Chapter III briefly reviews what is known about the phonetic origins of sound-patterns, while Chapter IV adopts and elaborates a quadri-partite synchronic typology distinguishing phonetic, phonological, morphological, and lexical-correspondence rules. Chapters V-VII then provide the empirical evidence--summarized in Chapter VIII--serving to motivate those 4 rule-types. Finally, Chapter IX briefly overviews the factors so far established as governing change in type by sound-structural rules.

But Chapters V-VII constitute the core of this work, subjecting to critical scrutiny previous proposals that specific sound-structural types are motivated by 6 particular conditions on the form, ordering, and application of rules. Chapter V (re)establishes that a constraint on "syllable-totaling" rules and the "Weaker Crossover Constraint" distinguish phonetic and phonological vs. morphological and lexical-correspondence rules, while the "Alternation Condition" and a constraint on "mirror-image" rules distinguish the phonetic rule-type from all others. Chapter VI demonstrates that, indeed, only morpholexical rules can be "exchange rules". And Chapter VII shows that the "Elsewhere Condition" isolates morphological rules proper from all others--because only their type is exempt from that constraint.
PART ONE
Preliminaries to an Evolutionary Typology of Sound-Structural Rules
[= Chapters I-II]

SECTION A
[= Chapter I]
CHAPTER I

Using a Rule Typology to Impose Constraints
On and Between Phonological and Morphological Rules

1.0.

This overall section of the current work provides a first general motivation for a typology of sound-structural rules. It does so by showing that such a construct plays an indispensable role in the task of placing constraints on the form of phonological and morphological rules. These two types of rules, that is, cannot be formally constrained separately, but only mutually and simultaneously.

The discussion proceeds by considering facts from both the history and the present state of linguistics. Although generative grammar has always at least tacitly recognized the existence of a set of morphological rules distinct from the set of phonological rules, it has consistently assigned processes with potentially ambiguous status to phonology rather than to morphology—but without ever presenting any explicit justification for this. However, the tacit premises which led earlier generativists to classify the numerous processes in question as "morphologically conditioned phonological rules" have been undercut by more recent developments in especially morphological but also phonological theory. Particularly important in this regard have been both processual approaches to word formation and lexical theories of morphology and phonology.

For example, once it is accepted that morphological rules can involve not only affixation but also quasi-phonological processes of permutation, deletion, and replacement, then it becomes both possible and plausible to
prohibit morphologically conditioned phonological rules and to assign such apparent processes exclusively to morphology. Still, some recent attempts to impose formal constraints on morphological rules have taken the opposite tack of trying to exclude processes like permutation from morphology. This presently unresolved controversy, however, can be settled by an appeal to a typology of sound-structural rules (= of morphological and phonological rules, but also of phonetic ones). By incorporating a large number of properties known to distinguish uncontroversial rules of the various different types, such a typology allows predictions to be made about the type membership of more controversial rules. And the result which ultimately emerges here is namely that there do exist morphological processes of metathesis, deletion, and substitution, but not any "morphologically conditioned phonological rules".


I.1.0. Not All in Language That Involves Sound Is Phonology.

Once sign language and writing have been set aside for separate study, human language is usually characterized as a system that associates sound and meaning. Perhaps it is the prominence of sound in this definition of language which is responsible for the fact that so many linguistic phenomena are assigned to the domain of phonology with so little justification.

Of course, the coequal juxtaposition of meaning with sound in the above definition makes it clear that semantics cannot easily be reduced in status to a subpart of phonology, and indeed there are no known proposals to this ef-
fect. On the other hand, semantics could itself be used to effect a transfer to phonology of a large and central part of the lexicon—which, while it interacts extensively with phonological rules, is normally considered to be distinct from these. At issue here is the possibility of removing from lexical representations all aspects that involve sound, with concomitant lexical insertion of homophonous inaudible lexical items into syntactic representations and subsequent introduction of sound via phonological epenthesis rules triggered by semantic features. Such an approach can even claim to receive some independent motivation from the fact that the "Government/Binding" (GB) theory of syntax propounded by Chomsky 1981 and others explicitly recognizes lexical insertion of phonologically null lexical items which nevertheless bear syntactic and other features.

In fact, syntax, too—or at least much of it—could also itself potentially be reassigned to the phonological component of grammar. That is, it is imaginable that all syntactic transformations could be eliminated and the surface forms of sentences derived by applying a sequence of familiar phonological operations to an underlying syntactic string. For example, it would be possible to reinterpret all deletion phenomena which are usually attributed to the operation of rules of syntax as actually resulting from phonological deletion rules. Similarly, all syntactic operations of insertion could be replaced by processes of massive multisegmental epenthesis introducing single words and even entire phrases in the course of a phonological derivation. Furthermore, the operation of phonological deletion and epenthesis rules could easily be combined in order to obviate the need for any syntactic processes of substitution or permutation. An extreme version of such an approach might even dispense with underlying syntactic strings entirely,
along with lexical insertion into them. Instead, the generation of surface sentences could begin in the lexicon and continue in the phonological component with repeated epentheses operating at the margins of a single word—perhaps even one with no underlying phonological content.

And yet such aggrandizement of the phonological component of grammar at the cost of the lexical and syntactic components has—to the best of my knowledge—never even been tentatively considered, much less seriously proposed. The reasons for this are not far to seek. Most importantly, there can be little hope of ever significantly constraining the theory of phonology if the set of phonological rules is allowed to contain such operations as those below—(1), for introducing the sounds into the underlying representation of the word dog, and (2a) followed by (2b), for Wh-Movement (or "Move α") of non-echoic who:

(1) $\emptyset \rightarrow /dag/ \begin{array}{c}
\text{[} \quad \text{canine} \quad \text{]} \\
\end{array}$

(2) $\begin{array}{c}
\end{array}$

a. $/hu/ \rightarrow \emptyset [/+\text{segment}] \begin{array}{c}
\text{[} \quad \text{Wh-} \quad \text{]} \\
\text{[} \quad \text{-stress} \quad \text{]} \\
\end{array}$

b. $\emptyset \rightarrow /hu/ \begin{array}{c}
\text{[} \quad \text{COMP} \quad \text{]} \\
\end{array}$

That is, the annexation by phonology of much or all of the lexicon and syntax can be achieved only at the cost of introducing myriad semantic and syntactic features into phonological rules—which entails an enormous increase in the generative power of phonological theory and a correspondingly enormous decrease in its explanatory power.

Also important, though, is the fact that reducing lexical and syntactic phenomena to phonological ones contravenes the whole thrust of recent generative linguistics toward modularity. On this view, grammar consists of
a large number of distinct (if not autonomous) components—each tightly constrained by potentially unique principles of maximal generality—whose overall interaction yields the complex phenomenon of human language. Clearly, then, there could hardly be anything more incompatible with linguistic modularity than an approach where much or all of the lexical and syntactic components of grammar is eliminated in favor of a far less constrained phonology.

These conclusions are surely uncontroversial, but an important moral can be drawn from them. On the one hand, it is undeniably true in language and grammar that meaning is directly or indirectly associated with sounds, that among other things the lexicon contains sounds, and that syntax involves sentences, phrases, and words which ultimately have much to do with sounds. On the other hand, though, such considerations do not entail that everything in language which has anything to do with sounds is ipso facto part of phonology. Rather, semantics, lexicon, and syntax all constitute linguistic domains in their own right, and each involves at least some—if not many—elements and generalizations which cannot be illuminated with reference to the phonological medium that realizes them. Nor is this kind of finding by any means isolated among the various disciplines dealing with humans, especially their psychology. To take a mundane but compelling example: although all behavior may ultimately yield to explanation on a chemical/physical level, there is a very real sense in which the question "What is something that many people eat for dinner?" is at present more insightfully answered by a response like "Spaghetti" than by one like "A particular set of combinations of carbon, hydrogen, and oxygen".
1.1.1. On the Subjugation of Morphology by Generative Phonology.

And yet, as ludicrous as the abovementioned possibility of phonological imperialism vis-à-vis semantics, lexicon, and/or syntax might seem to be in principle, and as rare as it definitely is in practice, the case can be made that a strikingly parallel policy of aggrandizing phonology at the expense of morphology has been pursued by generative grammar from its earliest days right up to the present. Moreover, generative phonology (henceforth usually GP) can be argued to have invaded the lexicon, after all, in the sense that numerous idiosyncratic phenomena which superficially appear to concern individual morphemes or words—or else small, closed classes of either of these—have been extracted from the lexicon and treated as phonological rules.

Thus, reflecting both these situations, the GP literature exhibits virtually innumerable instances\(^1\) where rules containing apparently morphosyntactic, arbitrary (morpho)lexical, and/or even morphosemantic features (like \(+\text{nomi}n\text{ative}\), \(+\text{derivable}\), and \(+\text{affective}\), respectively) are nevertheless considered to be phonological processes and consequently handled on a par with rules like English flapping or vowel nasalization, which mention only phonological features such as \(+\text{coro}nal\) or \(+\text{nasal}\) and the like. And the principal—if not the only—reason for treating the former types of rules as also phonological appears to be that they, too, involve sounds or parts of sounds (in short, phonological features) somewhere in their outputs and inputs, and often in their environments.

The point here is not that it is a priori valid to claim that the presence of morphosyntactic, morpholexical, or morphosemantic features in a rule automatically disqualifies it from being purely phonological, but rather that ex-
ceptionally little discussion has ever been offered in the GP literature either for or against this position—a position which seems quite plausible, given the considerations adduced here at the outset.

This situation is undoubtedly at least partly due to the heavy emphasis which early GP laid on the differences existing between it and "autonomous phonemic" post-Bloomfieldian American structuralist phonology. That is, a major focus of the newer phonological theory was to attack and break down the absolute prohibition against "mixing levels" (especially between phonology and morphology) that was such a strongly held tenet within the older approach. Part of this offensive strategy consisted in showing that a rigid separation of allophonic and morphophonemic rules resulted in lost generalizations, as in the famous Russian example discussed by Halle 1957, 1959. Another part of the strategy involved demonstrating the relevance of morpheme boundaries for rules of both abovementioned types. Given all this, it would probably have seemed counterrevolutionary and even treasonous for any early generative phonologist to have insisted on a stricter separation of phonological from morphological rules.

But, in any case, the occurrence of apparently morphological and lexical features in putatively phonological rules is undeniably one of the hallmarks characterizing the so-called "Standard Theory" of GP (or SGP, for short). This can be convincingly shown by consulting the list (on pp. 238-245) which summarizes all the "phonological rules" posited for English by Chomsky and Halle 1968 in their classic presentation of SGP, *The Sound Pattern of English* (or SPE). Of the thirty-three rules given there, no fewer than six (or nearly 20%) include features that are morphological and/or lexical—or "morpholexical", to return to the felicitous cover term introduced by Bloom-
field 1933.

It is important to emphasize that the calculation just made excludes Chomsky and Halle’s nine so-called “readjustment rules”, which are acknowledged even by them as being at least partly morpholexical, and is based only on generalizations claimed to concern nothing but sound structure. Thus, for example, SPE’s rule of Velar Softening contains [+derivable] (= “enter[ing] into the Romance derivational system”), while Vowel Shift has a subpart (for, among other things, irregular verb alternations like sit/sat) triggered by the arbitrary lexical diacritic [+F]. A subpart of Main Stress refers to either the lexical diacritic [+D] or the particular morphemes -fic- and -ate. Among the set of rules for Laxing, one rule applies to the vowel of the suffix -ar when it precedes the suffix -y, while Tri-syllabic Laxing has a special subrule conditioned just by the morphemes -ic, -id, and -ish (but only when they express certain meanings—their homophones are excluded here). And, finally, both the Spirantization (d → z) and Devoicing (z → s) rules of SPE refer crucially to the morpheme -ive. In fact, the entire environment of the latter rule is /__ + -ive (and tentatively also /__ + -age and /__ + -is).

This aspect of SGP was, of course, not only well known but also widely criticized—as, for instance, in several of the published reviews of SPE (many of them reprinted in Goyvaerts and Pullum (eds.) 1975). Yet it is a much less well-known circumstance, and hence a much less widely criticized one, that the inclusion of such apparently morpholexical features in putatively phonological rules has remained a hallmark of GP even well into the post-SPE era. Thus, more than a decade after the publication of SPE, Kenstowicz and Kisseberth 1979—an otherwise quite comprehensive introductory
survey of GP--devotes an entire chapter to "The Role of Syntax[, Morphology,] and the Lexicon in Phonology" without discussing or even mentioning the possibility that rules crucially mentioning features like [+past] or [+learned backing] are morphosyntactic or lexical (respectively), rather than phonological.

Nor have matters changed much since 1979. Now, nearly twenty years since the appearance of SPE, advocates of the theory of "Lexical Morphology and Phonology" (LMP; introduced most accessibly in Kiparsky 1982a, 1982b) have proposed that phonological rules even of a non-redundancy type must be allowed to accompany morphological rules in the lexicon, in order correctly to interact with them there. However, proponents of LMP cite as part of their phonological evidence for this claim the behavior of such rules as English Main Stress and Trisyllabic Laxing--which they formulate, as in SPE, with partly morpholexical conditioning. Here, once more, not a single argument is presented against the plausible alternative view that the processes in question are morpholexical rather than phonological--despite the crucial relevance of this issue to the claim just mentioned.

1.1.2. Proposed Reasons for Minimizing Morphology in Generative Grammar.

As puzzling as the persistence of this situation may at first appear, there again exist possibilities for explaining it with reference to the recent history of linguistics. The central matter involved here is the fact that, while generative grammar has always wholeheartedly espoused an Item-and-Process framework in phonology, such a processual approach has been slow to catch on in morphology. Rather, the dominant generative view of morpholo-

10
gy has always been that morphemes are things and that word formation is essentially nothing but the compounding and affixation of such things.

Such a state of affairs is actually quite surprising—and in two different ways. For one thing, given the contrasts between American structuralist linguistics and generative linguistics in so many other areas of grammar, it is strange that the newer framework should have carried over its older rival’s Item-and-Arrangement approach to morphology without much in the way of either change or comment. And, for another thing, whereas generative phonologists seem to have adopted the maverick American structuralist Edward Sapir almost as a kind of patron saint, affirmatively citing him in their work with great frequency, the existing GP literature makes absolutely no mention of the fact that Sapir’s morphology was explicitly processual. In his 1921 book *Language*, for example, Sapir completely avoided the term "morpheme", preferring instead to talk about "grammatical modification[s]" and--most frequently--"grammatical processes" (although "grammatical element" also occurs a number of times).

Still, regardless of such considerations, most GP works—from Halle’s 1959 *The Sound Pattern of Russian* through *SPE* and on up to the present—have maintained an essentially American structuralist Item-and-Arrangement approach to word formation. Thus, even within the current boom of generative morphology, the majority of frameworks still treat morphology as essentially exhausted by compounding and affixation (together subsumable under the term "concatenation", apparently introduced by McCarthy 1979/1982a).

This is clearest in the approach where morphology is taken to be "*The [Internal] Syntax of Words*", as in works like Williams 1981, Selkirk 1982b,
and most of Lieber 1980/1981, among others. For these scholars, even affixes are not part of any morphological rules, but are rather lexical items in their own right, with membership in major lexical syntactic categories. An essentially concatenative basis for word formation can also be documented for the abovementioned Lexical Morphology and Phonology (LMP) of Kiparsky 1982a, 1982b and others. This is arguably so because even the theory's occasional early statements about treating affixes as "so many ... rules" (cf. Kiparsky 1982a:6/1982b:134) are belied by a heavy emphasis on bracketing and on bracket erasure which makes little sense for any morphological operations other than affixation, while later versions of LMP have in fact explicitly switched to an analysis of affixes as lexical items (cf. Kiparsky 1983). Finally, the "Autosegmental Morphology" (or "Prosodic Morphology") of McCarthy 1979/1982a, 1981 and others diverges from American structuralist morphology (and much other generative morphology) in introducing non-linearity and subsegmental or even non-segmental morphemes, but it actually does so largely in an attempt to make more of word formation amenable to analysis as affixation (cf., e.g., the explicit claim of McCarthy 1984-MS:17 that "morphological structure is exclusively or nearly exclusively affixing").

It is admittedly true that Autosegmental Morphology, along with the other two theories just mentioned, makes some small allowance for word-formational truncation and for morphological replacements like Ablaut and--to the extent that it is different--Umlaut. Still, such phenomena are by no means well integrated into the overall formal systems of these theories, where they in fact remain exactly as peripheral as "replacive morphemes" and "subtractive morphemes" were in American structuralist morphology (cf. the fuller
discussion of this comparison in Hoeksema and Janda 1985).

For all three of the abovementioned theories of morphology, then--Word-Syntactic, Lexical, and Autosegmental--the only kind of morphological rule which is really expected to occur with any frequency in languages is affixation of the type formally describable as follows: \( \emptyset \rightarrow X / A \_ \_ B \). In defense of GP and generative grammar as a whole, it should be observed at this juncture that at least such affixation processes have constituted an irreducible core of morphology which generativists have rarely, if ever, tried to take over into phonology. Regardless of whatever other objections have deservedly or undeservedly been made about GP, that is, there have never to my knowledge been any criticisms occasioned by claims like the logically possible one that the set of phonological rules includes an eponym process realizing the regular English plural of nouns as a final /z/, as in (3) below:

\[
(3) \emptyset \rightarrow /z/ / X \_ Noun^+ \; [\; \_ \_ \; ]\; \; \; (+\text{plural})
\]

Nevertheless, quasi-eponymetic morphological "spell-out" or "realization" rules like this, which introduce the first phonological manifestation of an affixal morpheme next to or in a root or stem, are basically the only processes which all generative phonologists accept as morphological solely on the basis of the morpholexical features in them. To repeat, this is largely due to two facts: (1) most generative grammarians have unquestioningly carried over from American structuralist linguistics an Item-and-Arrangement approach in which morphology is reducible to the affixation of morphemes as things, since (2), aside from roots and stems, affixes seem to be the only things around which are available for concatenation.
Given that, on this standard approach, morphemes and morphology do not involve processes, it is clear why rules which include morpholexical features but perform apparently phonological operations of substitution (i.e., feature change), deletion, and permutation (i.e., metathesis) have been treated in most GP as phonological rules. Such processes cannot be morphological, because they are not characterizable as affixations of "thing" morphemes, and there does not seem to be anywhere else in grammar to put them except in phonology. After all, they involve sounds, and their phonological parts resemble other rules whose inclusion in phonology is uncontroversial (namely, ones which contain no morpholexical features, but only phonological ones).

It is actually not difficult to counter such argumentation with an at least equally cogent alternative line of reasoning based on a processual approach to word formation. In fact, a brief discussion of such "process morphology" can here profitably be combined with a presentation of examples illustrating the morpholexically triggered substitutions, deletions, and permutations mentioned immediately above. However, two further considerations beyond an Item-and-Arrangement morphology have been taken to favor the recognition of "morphologically (and lexically) conditioned phonological rules" in GP, and so it seems most appropriate first to adumbrate these additional arguments and then to respond to all three of them together.

Thus, a second reason why GP has overwhelmingly tended to assign phonological status to rules of substitution, deletion, and permutation even when they possess morpholexical conditioning has to do, on the one hand, with the fact that such processes almost always lead directly to allomorphy
of roots and/or affixes, whereas (quasi-epenthetic) affixation seldom directly does so. On the other hand, the nature of early generative phonology was such that allomorphy was felt to be more properly the domain of phonology than that of morphology. Indeed, whereas morphology had once been a central part of the language system for American structuralists, in generative grammar it was more or less entirely swallowed up by phonology and syntax (and, later, the lexicon). In short, then: since morpholexically conditioned substitution, deletion, and permutation typically lead to allomorphy, and since accounting for allomorphy is usually thought to be the responsibility of the phonological component of grammar, morpholexically conditioned processes of the abovementioned types have often automatically been assumed in GP to be phonological.

The third reason why most GP has treated morpholexical processes of substitution, deletion, and permutation as phonological rules concerns rule ordering. Certainly up through the time of SPE, the dominant generative view was that all morphological rules precede all phonological rules. However, it had been noted even before then that rules with morphological or lexical conditioning sometimes have to be ordered after one or more clearly phonological rules. If the former are considered to be also phonological rules themselves, though, the claim that morphological rules always precede phonological ones can be maintained.

To the best of my knowledge, the preceding three reasons represent the only justification which--whether explicitly or implicitly--has ever been given in the GP literature as supporting the view that phonological rules may have morpholexical conditioning (or, to put things in another way, that having morpholexical conditioning does not suffice to disqualify a rule from count-
ing as phonological). Such a conclusion does not, of course, entail that there are no morphological rules of substitution, deletion, or permutation. Still, it is also significant and actually somewhat surprising that, at least as regards substitution and deletion, this related proposition has not been discussed in GP until quite recently (by McCarthy 1984-MS). This is so because, once some such operations are admitted in morphology, the need arises to justify why other substitution and deletion processes should not also be treated as morphological, rather than phonological.

1.1.3. Arguments for an Expanded View of Morphology in Generative Grammar.

1.1.3.0.

Nevertheless, what is most important and most puzzling about all these matters is that a number of well-known recent and even by now fairly old developments in generative grammar have undercut all three of the arguments given above for why morpholexically conditioned processes of substitution, deletion, and permutation must be considered phonological rules. And yet, in the total absence of any new justification for them, the literature is still replete with numerous instances of this alleged type of rule.

1.1.3.1. Allomorphy and the Interleaving of Morphological and Phonological Rules.

The argument that morpholexically conditioned processes of substitution, deletion, and permutation must of necessity be phonological because they usually produce allomorphy was the first to be invalidated by innovations in
GP. In particular, it was already mentioned above that SPE introduced a set of "readjustment rules"—distinct from phonological rules—which for English included processes like $t \rightarrow [+\text{voice}]/= \text{ver}___ + \text{ion}$, as in $\text{subvert} \sim \text{subversion}$ (where eventually $d \rightarrow z \rightarrow \tilde{z}$ by Spirantization and Palatalization). Here, the operation of the relevant rule unmistakably contributes to allomorphy. Later, however, Aronoff 1974/1976 further systematized the set of (re)adjustment rules and presented evidence that it to a large part consisted of "allomorphy rules": processes "which effect... a phonological change... but apply only]... to certain morphemes in the immediate environment of certain other morphemes"; they "are external to the phonology" (p. 98). Since 1976, the notions of readjustment rules and allomorphy rules have undergone considerable reinterpretation, with varying revisions in different frameworks, but all their revised analogs share the property of being morphological or lexical rules—rather than phonological rules—which account for allomorphy.

Although Aronoff 1974/1976 was the prime introducer of allomorphy rules into generative grammar, and although he thereby encouraged the recognition of many more processes as morpholexical than had theretofore been the case, he nevertheless did not question the idea that there exist morpholexically conditioned phonological rules. In fact, he explicitly claimed that "not all rules which contain morphological information are rules of ... allomorphy" (p. 98); some "morphologically and lexically governed rules are ... [late] rules of the phonology" (p. 113). However, Aronoff's principal reason for this position was his belief that no independent evidence existed to support the view that any morphological rules ever need to be ordered between two word-level phonological rules—combined with the fact
that a theory which prohibits the free intercalation of phonological and morphological rules is obviously much more restrictive than one which does not. Again, though, developments which have occurred in GP since that time have by now resulted in widespread acceptance of the position that interleaving of morphological and phonological rules is real, common, and natural.

Anderson 1974a, 1975 was probably the first mainstream generativist to espouse this view, but the pendulum swing toward its general adoption was mainly accomplished via the introduction of the abovementioned theory of Lexical Morphology and Phonology (LMP) in Kiparsky 1982a, 1982b. By now, there appears to be little or no resistance offered to the proposal that phonological and morphological rules can be mutually intercalated in the lexicon of a language. For example, a particularly clear illustration of how a phonological rule must sometimes precede a morphological one is provided by Javanese as analyzed by Dudas 1974, 1976 and--extending her analysis--Anderson 1979b/1980b (cf. also Steriade 1986b and references there).

Javanese adjectives have two forms, primary vs. "elative" (a kind of intensive), of which the second is derived from the first by replacement of its last vowel. If that vowel is front and unrounded (i.e., /i/ or /e/), it is replaced in the elative by /i/; if it is back and round (i.e., /u/ or /o/), it is replaced by /u/. This situation is illustrated by primary/elative pairs like wani/wani 'bold', luwe/luwi 'hungry', abot/abut 'heavy', and alus/alus 'refined'. However, some adjectives which have /a/ as the last vowel of their primary forms show /i/ in the elative, while others show /u/. The choice between these possibilities is predictable, since elative
/i/ replaces primary /a/ when the latter occurs in a closed syllable (cf. gampang / gamping 'easy'), while elative /u/ replaces primary /a/ when the latter occurs word-finally (i.e., in a final open syllable; cf. /kəmba/ / kəmbu 'insipid')

Superficially, it at first appears that such specifications referring to the syllable-structural environment of /a/ must be built into the otherwise straightforward morphological rule for Javanese elative formation. It turns out, though, that numerous regular alternations like dina 'day' ~ dinane 'the day' independently motivate a phonological rounding and raising rule for the language: a → o/ _. Thus, the primary form of /kəmba/ actually shows up on the phonetic surface as kəmbo, from which elative kəmbu can be derived in the same way that abut is derived from about -- and without any complication of the morphological rule needed for the latter alternation. Following its reformulation in Hoeksema and Janda 1985, the Javanese morphological rule of elative formation can therefore be given roughly as follows:

(4) \[ +\text{elative} \]
\[
\begin{array}{c}
\frac{\text{V}}{1} \\
\text{around} \\
\frac{\text{(C)}}{3}
\end{array}
\Rightarrow
\begin{array}{c}
\frac{\text{V}}{1} \\
\text{back} \\
\text{to} \\
\frac{2}{3}
\end{array}
\]

However, such an analysis is workable only if the phonological rule introduced above is ordered before elative formation, in order thereby to feed it. This Javanese example, then, represents a case where a morphological rule must follow a phonological one, as well as providing an instance of a morphologically conditioned substitution process.

I.1.3.2. Initial Motivation for a Generative "Process Morphology".
Such a finding leaves for consideration here just the last of the above-mentioned three proposed reasons why morpholexically conditioned rules of substitution, deletion, and permutation should be considered phonological, rather than morphological or lexical. This is, namely, the view that affixation is the only possible type of morphological operation, so that all other apparent morphological processes are actually phonological rules. As discussed previously, such an Item-and-Arrangement approach has been the dominant one in generative grammar—even though it not only represents an uncharacteristic carry-over from Bloomfieldian and post-Bloomfieldian American structuralism but also is diametrically opposed to the ideas and descriptive practice of Sapir. An uncharitable evaluation of this situation might attribute the relative neglect of process morphology in generative grammar to a lack of imagination or flexibility. However, given the constancy with which often rather radical innovations have been proposed and sometimes accepted by generativists during the past three decades, it must be the case that other, more substantive issues are involved.

And, indeed, matters having to do with the frequency of affixation in the world's languages and with the possibility of imposing constraints on word formation rules seem to be what has most held back a processual approach, from coming into its own in generative linguistics. That is, for one thing, affixation is definitely the most common means by which morphosyntactic and morphosemantic categories are marked in human language, and it is also undoubtedly better studied and better known than any other such means. And, for another thing, a theory of morphology whose rules are limited to affixation is clearly much more constrained than one which allows morphological processes of substitution, deletion, and permutation.
Nevertheless, recent work in morphology—as well as older work which is only now coming to be widely known and appreciated—has increasingly suggested that non-affixational processes of word formation, while less numerous than affixational ones, are still extremely common. Thus, as the available descriptive materials on the world's languages have gained in depth and breadth, it has become clear that grammars which utilize only affixation for word formation purposes are the exception, rather than the rule. Indeed, the reason why affixational, concatenative morphology loomed so disproportionately large in previous studies can now be seen to have had more to do with the preoccupations of early generative linguists than with the facts of languages.

Specifically, generativism was concerned at its outset with syntax and phonology in general, almost to the total exclusion of morphology. And the little attention that it did devote to morphology was focused primarily on word formation in "Standard Average European" languages—especially English, whose morphology must rank as positively impoverished in comparison with that of, say, polysynthetic Native American languages. But, with the deepening and broadening of generative grammar, it has become evident that, for example, morphological substitution processes which are the sole markers of some grammatical category are extremely common across most languages and virtually all language families. In fact, it is not necessary to leave Indo-European for Javanese in order to find extensive exemplification of them, since they occur in the Ablaut systems of many familiar tongues, including English.

Nor are morphological deletion processes crosslinguistically uncommon. Actually, a number of them from English and other languages were
described by Aronoff 1974/1976 under the rubric of "truncation rules": processes which "delete... a designated stem-final morpheme before a designated suffix" (p. 88), such as the English rule which accounts for alternations like evacuate - evacuee/*evacuatee. Since Aronoff analyzed truncation rules as a subtype of (re)adjustment rules and therefore as coordinate with allomorphy rules, he obviously viewed them as morphological rules. However, Aronoff did not treat all morpholexically conditioned deletion processes as truncation rules, as is clear from his discussion of a rule proposed earlier by Kiparsky 1966: "[The German] rule of ge- Deletion ... deletes a specified morpheme ... before an unstressed syllable[, which] is not a morphological condition... but rather a phonological one. Therefore, ge- Deletion is not a rule of truncation...[, since such rules apply] only ... in the context of other morphemes" (Aronoff 1974/1976:98).

Once again, though, the sole reason why Aronoff analyzed the last-mentioned process in question as a phonological rule was apparently that German ge- Deletion must be ordered between two phonological rules, whereas Aronoff then believed that no independent evidence existed to motivate the possibility of sandwiching morphological rules between phonological ones. Now that the interleaving of phonological and morphological rules--at least in the lexicon--is widely accepted, however, there is no longer any compelling reason not to treat German ge- Deletion as a morpholexical rule.

A further example strongly supporting this view is provided by Rotuman (as analyzed--mainly on the basis of data from Churchward 1940--by several generativists; see the summary and references in Janda 1984 and Hoeksema and Janda 1985). Rotuman has a morphological category, usually
called the "incomplete phase", which expresses a number of meanings including primarily indefiniteness and incompleteness. While generative analysts are currently engaged in a lively debate regarding whether this category is sometimes marked solely by morphological metathesis, they are nearly unanimous in concluding that the category is at least sometimes marked solely by a morphological rule of final-vowel deletion (or apocope). Again following Hoeksema and Janda 1985, this process can be given roughly as in (5) below:

\[(5) \{-\text{complete}\} \]
\[
\langle XC, V / \quad 1 \quad 2 \quad \Rightarrow / 1 / \rangle
\]

On this analysis, then, consonant-final incomplete-phase surface forms like ar 'front' are derived from vowel-final underlying forms like /aro/ by a morphological deletion rule. Words in the complete phase are not subject to this rule, and so their final vowel surfaces unscathed, as in corresponding aro. Beyond its simplicity, such an account has much strong evidence in its favor. Most important are the three ways in which it is superior to the diametrically opposite analysis where a final vowel is affixed to words in the complete phase, but no changes at all occur in the incomplete phase. The first consideration here concerns the fact that Rotuman words are overwhelmingly vowel-final everywhere except in the incomplete phase, which is most compatible with an account involving underlying final vowels and a morphological rule of final-vowel deletion limited to that category.

A second consideration, though, is that the opposite analysis--with final-vowel affixation in the complete phase--requires Rotuman to have five more phonemes than does a treatment with final-vowel deletion. This is because
three phonological rules of Rotuman appear to precede the morphological process at issue here—for example, Fronting, whereby \( a \rightarrow [æ]/\text{C}_0 \varepsilon \). This is illustrated by the fact that the phone \([æ]\) occurs in Rotuman only before a surface \([ε]\) in the next syllable (as in the complete phase of 'part of a roof', \( hælɛ \)) and in the incomplete phase of words which, on the account favored here, have underlying final \(/ε/\) (like corresponding \( hæl \)).

Given this situation, Rotuman \([æ]\) can be analyzed as an allophone of \(/a/\) in underlying complementary distribution with \([a]\), since the latter never occurs before surface \([ε]\) and does not appear in incomplete-phase forms with underlying final \(/ε/\). Thus, when not followed in the next surface-syllable by a vowel other than \([ε]\), Rotuman \([a]\) occurs only in forms like \( hæl 'un-
dercooked' \) (underlyingly \(/ha1ə/\)), which corresponds to complete-phase \( hala.\) On the other hand, if the incomplete phase is not derived by a morphological rule of final-vowel deletion, then the occurrence of the vowels in words like \( hæl \) and \( hala \) is not predictable, and an extra phoneme \(/æ/\) is needed. Parallel facts and analytical considerations concerning four other sounds of Rotuman also favor deriving certain incomplete-phase forms via a subtractive process in the morphology of the language.

A third and final argument for positing a morphological rule of final-vowel deletion in Rotuman concerns the fact that all incomplete-phase forms are predictable from their complete-phase counterparts, whereas the converse is not true. Thus, in the complete phase, the abovementioned form 'front' \( arə \) contrasts with \( ara \) 'mole on the skin', but the incomplete-phase forms of both these words have the identical shape \( ar \). Consequently, an analysis which derived the complete phase by final-vowel affixation would require for every root in the Rotuman lexicon a specification of which vowel
is suffixed to it in that category, whereas the account favored here is totally free of such encumberment.

The conclusion seems to be well-established, then, that Rotuman has a morphological rule of final-vowel deletion which for many words provides the sole mark of the category "incomplete phase"--and also that, as was first emphasized by Anderson 1974a, 1975, this morphological rule follows at least three phonological rules of the language.

Substitution and deletion, though, are not the only non-affixational morphological processes which are attested in the world's languages. Rules of morpholexically conditioned permutation--that is, morphological metathesis rules--have also been posited. And they have been posited not only (as mentioned above) for Rotuman, but also for Akkadian, Hebrew, and other Semitic languages, for Awaŋjiŋ and other Australian languages, for Clallam and other Salish languages, and for Yawelmani and other California Penu-tian languages, especially those of the Miwok/Costanoan (or Utian) branch. The status of these rules as morphological processes--two of which will be illustrated here further below--is admittedly much more controversial than that of morphological deletion and substitution. Still, the surprisingly large number of morphological metathesis rules that have been proposed to date should suffice to add a final quota of support to the overall claim presently at issue: that non-affixational morphological processes as a class are extremely common and so cannot be denied status as one or more types of morphological rule on the grounds that they occur with a frequency qualitatively different from that of affixational rules of morphology.

In particular, the fact that non-affixational processes like substitution, deletion, and permutation are widely found serving to effect the only realiz-
tion of important morphological categories in languages (like the Rotuman incomplete phase) completely invalidates any attempt to reanalyze such processes as morpholexically conditioned phonological rules solely on the strength of some vague claim that they are somehow too marked to be bona fide morphological rules. Non-affixational morphological rules exist, then, and they exist in such numbers that they cannot be very marked. For example, there is no certainly no evidence available which would suggest that they are somehow hard for adults to use or for children to learn.

Quite the contrary: evidence from a psycholinguistic study by Boyce, Browman, and Goldstein 1983 suggests that the non-affixational morphological processes which constitute the system of "mutations" in Welsh are in fact quite easy for native speakers to process--apparently because they are so regular. Correspondingly, there is reason to believe that the frequency of affixational morphology is due, not to its somehow being unmarked, but rather to the frequency of the processes of linguistic change which cause it to arise: namely, the "downgrading" of content words to function words, followed by their cliticization onto other words, followed in turn by their downgrading from clitics to affixes. Non-affixational morphological rules, on the other hand, appear to arise via linguistic changes like the morphologization of phonological rules--which, while it is not uncommon, is nowhere as frequent as downgrading and cliticization.

These matters concerning diachronic reanalysis of rules and concomitant changes in rule type, though, are to be reserved for more specific discussion later in this work. What makes them significant and relevant enough to mention at this point is mainly the fact that they further confirm the conclusion that processes of non-affixational morphology are attested on a
wide scale--i.e., that there exist numerous morphological rules of substitution, deletion, and permutation.

1.2. Implications of Process Morphology for Generative Phonology.

1.2.0.

Such a conclusion obviously has far-reaching consequences for morphological and phonological theory, and thus for grammatical theory in general. First of all, the recognition that there do exist morphological rules of substitution, deletion, and permutation leaves room for only one possible evaluation of the many instances in the GP literature where such processes are labeled and/or treated as morphologically conditioned phonological rules. Namely, such cases must be evaluated as corroborating the accusation--made at the outset of this chapter--that generative grammar has consistently been guilty of illegitimately aggrandizing phonology at the expense of morphology, and that the only apparent reason for this seems to have been the simplistic view that phonology encompasses all aspects of the linguistic use of sounds. And yet this is the very principle that was here earlier shown to lead to absurd results when applied to any area of grammar other than morphology--that is, to semantics, the lexicon, or syntax.

To expand briefly on what was said previously about this issue: since all spoken language at some level involves a systematic connection between sound and meaning, it cannot seriously be maintained that everything in languages which has to do with sound is phonology, or else the field of phonology comes to encompass--aside from semantics--virtually the same content as that of grammar in general.
Even a brief moment's reflection from a slightly different perspective should suggest that phonology does not exhaust the range of linguistic phenomena involving the manipulation of sounds. To wit, if language is defined simply as a system that for the most part arbitrarily associates sounds and meanings, then the vocal/auditory communication systems of birds and many other non-human animals must count as languages. But if language is instead defined as a system that associates sounds and meaning via the agency of morphology (including a lexicon) and syntax, then it is clear that no other animals in the wild come close to having a language.

Furthermore, defining language in such a way that morphology and syntax have a central place in it—with a strong relationship to sounds as well as to meaning—provides a justification for most linguists' skepticism regarding the linguistic abilities of non-human primates in captivity. After all, even the human-inculcated communication systems of the latter lack complex syntax and (to my knowledge) especially derivational and inflectional morphology—e.g., "words" of three or more morphemes.

It must be granted, then, that some aspects of the linguistic manipulation of sounds are facts about morphology, rather than about phonology. Once such a view is adopted, though, it raises a second important general issue: that of the proper analysis of those morphological operations which deal with sounds. In this regard, there immediately arise a host of questions. For example, what qualitatively different types of sound-manipulating processes exist in the morphologies of the world's languages? And how strictly can the range of such processes be constrained, and by what kinds of restrictions?

Of course, such issues have already been indirectly addressed within
some of the morphological frameworks mentioned previously. Although Selkirk's 1982b *Syntax of Words* approach, for instance, essentially ignores non-affixational processes of word formation, the closely related views of Lieber 1980/1981 encompass a component of "string-dependent" rules like replacive German Umlaut. Similarly, Lexical Morphology and Phonology (LMP) as presented in Kiparsky 1982a, 1982b does not devote much attention to non-affixational morphological rules, but it nevertheless arguably advocates considering even affixation to be a process (although Kiparsky 1983 moves away from such a view). Finally, McCarthy's 1979/1982a, 1981 et seqq. Autosegmental Morphology—despite its assertion that word formation is mostly (if not exclusively) affixational—also relies heavily on morphological processes of permutation, replacement, and subtraction (cf., e.g., McCarthy's Classical Arabic rules for the "Eighth Binyan Flop", for imperfective/perfective "Ablaut", and for "Second, Fifth[, Twelfth, Thirteenth] Binyanim Erasure", respectively.) Still, none of these frameworks achieve a successful integration of such processual word formation rules with their Item-and-Arrangement (or I.A.) cores.

On the other hand, Sapir's exclusively processual approach to morphology has been taken up since the mid 1960's by an increasingly large number of linguists. The central principle shared by all their theories is that a completely processual account of word-formation is superior to a mixed processual and IA one. This is because morphological operations of permutation, replacement, and subtraction cannot legitimately be analyzed as concatenating "thing" morphemes, but only as processes, whereas affixation can be elegantly analyzed in processual terms parallel to those required for the abovementioned other types of rules. In other words, non-compound
morphology is neither mainly nor exclusively the concatenation of preexisting stretches of phonological material (i.e., morphemes), but instead involves various sorts of changes performed on a stem for the purpose of marking morphological categories. It is therefore not surprising that both morphology and phonology utilize the same five major types of operations on sounds (= addition, permutation, replacement, subtraction, and combinations of these), since these are in fact the only five logically possible kinds of operations that can be performed on phonologically manifested input strings. (And even permutation and replacement are in fact reanalyzable as combinations of subtraction and addition.)


Now, admittedly, these processual morphological frameworks are per-
haps less well known than the essentially IA theories discussed in the last paragraph but two. Nevertheless, they represent a substantial body of results and proposals with which to confront and integrate issues like the one that is the central concern of this first part of the present chapter: do alleged morpholexically conditioned phonological rules actually exist, or are they instead really morphological and lexical (morpholexical) rules? Obviously, this question is linked up in the most intimate manner with the abovementioned matter of what operations should be allowed by a maximally constrained morphological theory—in a way that can now be demonstrated by comparison of a pair of concrete examples. The first illustration comes from Clallam (an Amerindian language of the Pacific Northwest belonging to the Straits group within Coast Salish) and is based on the discussions in Janda 1982a, 1983b, and especially 1984 and Hoeksema and Janda 1985. The second illustrative case comes from Akkadian, an ancient East Semitic language; it draws mainly on facts presented in McCarthy 1979/1982a and 1981.


Virtually the only available sources of data and analyses for Clallam are Thompson and Thompson 1969, 1971. According to them, the "actual" aspect of the language in question is marked solely by morphologically conditioned metathesis. This aspectual category refers to an "action or state [as being] in effect at a particular moment", just like the English -ing form of a verb. Actual aspect also resembles the Slavic imperfective—except that, unlike the latter, it is a marked form (cf. Thompson and Thompson 1969:215).
Actual/non-actual "... is the most fundamental aspectual distinction [in Clallam]; it pervades the ... language" (cf. 1971:274). Thompson and Thompson analyze non-aspectual aspect as being literally unmarked by any change in the underlying forms of verb roots. Actual aspect is marked differently in roots of different underlying shapes.

Roots of the form CVC... for instance, mark actual aspect by infixing a glottal stop after the V (often along with certain other changes): cf., e.g., 'wipe', with non-actual ?áč- vs. ?á-ʔ-č- actual. (However, in order to occur as words, roots must be suffixed with some such element as -t, glossed by Thompson and Thompson as '[with/ by some agent in ]control[ of the situation]'. Thus, for the example just cited, cf. ?áč- t vs. ?á-ʔ-č-t.)

But Clallam verb roots of the form CCV... (of which there are many) mark actual aspect by apparent metathesis of their second consonant with their first vowel, as shown by the following non-actual/actual pairs: čkʷú-/čukʷ- 'sting; shoot', ččí-/ččǐ- 'scratch', tčo-/tć- 'shatter', kʷšá-/kʷós- 'count', štá-/štā- 'walk', pkʷó-/pōkʷ- 'smoke', qqí-/qíʔ- 'restrain', and čšú-/čús- 'throw' (where s → ŋ/.c/). Such data motivate for Clallam the following morphological rule of root-internal metathesis in the actual aspect:

\[
\begin{align*}
(6) & \quad \text{[+actual]} \\
/C C V X/ & \quad \Rightarrow /1 3 2 4/
\end{align*}
\]

Now, when certain CCV... roots of Clallam combine with individual members of a particular set of suffixes which attract stress away from such roots and thereby cause them to lose their vowels (and so be in the "reduced grade"), root-internal metathesis is obviously blocked from applying. However, for certain combinations of reduced-grade root + suffix + suffix, metath-
esis marking the actual aspect still takes place—namely, between the suffix-
es. Thus, e.g., when the verb \( \acute{x}k\,\text{w} \, \acute{\alpha} \) 'grasp; take hold of' occurs in its re-
duced-grade form \( \acute{\cdot}k\,\text{w} \) conditioned by the following stress-attracting suf-
fix \( \overline{-f} \) 'persistent[ly]', and when this \( \overline{-f} \) is underlyingly followed by the
abovementioned further suffix \( -t \) 'control', there is a non-actual/actual al-
ternation as follows: \( \acute{\cdot}k\,\text{w}-f-t/\acute{\cdot}k\,\text{w}-t-\overline{-f} \). These and similar facts mo-
tivate an additional morphological metathesis rule for Clallam—one for cer-
tain suffixes after roots in the reduced grade:

\[
(7) \begin{array}{c}
+\text{actual} \\
+\text{persistent} \\
+\text{control}
\end{array} \\
/CC\,f\,t/ \\
1 \ 2 \ 3 \Rightarrow \ 1 \ 3 \ 2
\]

(In fact, Clallam probably has at least two more morphological metathesis
rules involving combinations of roots and affixes, but these will not be
discussed here. For further information regarding them, see Thompson and

As pointed out in a previous section, Clallam is only one of several lan-
guages providing a strong prima facie case for morphological metathesis
rules. However, it represents probably the most robust such instance, be-
cause the relevant facts are not easily open to reanalysis via an autoseg-
mental approach manipulating association lines as they are in, say, Rotu-
That is, Clallam has no independently motivated processes deleting vowels
and/or consonants in the actual aspect which would allow a non-metatheti-
cal account of the data at issue. Still, there is some morphological condi-
tioning of stress in the language, and several closely related Salish lan-
guages exhibit both this phenomenon and concomitant deletion of unstressed
vowels—in a way that gives the surface appearance of morphological metathesis (cf., e.g., Demers 1974 on neighboring Lummi). In fact, Thompson and Thompson 1969 consider a similar analysis for Clallam but reject it because there is no direct evidence for the hypothetical underlying representations which it requires.

Thus, they seriously entertain but then discard an approach where, e.g., non-actual qi'ıf would derive from /qi'ıf/, while actual qi'ı would derive from /qi'ı/ (with the accentual pattern in the latter being created by a morphological rule of stress shift).

McCarthy 1984-MS, on the other hand, maintains that "...[a]bsolutely no data or principle[d] argumentation support metathesis over stress shift as an account" of the relevant forms. He further suggests that a stress shift analysis can be carried over to the case of apparent suffix-metathesis discussed above, as long as the 'control' suffix is taken to be /ti/ underlyingly, rather than just /t/. Thus, the already abovementioned non-actual form Xk'w-t-t can be derived from /Xk'w-t-t/, while actual Xk'w-t-t can be derived from /Xk'w-t-t/. On the grounds that a stress shift analysis can handle both root-internal and suffixal metathesis, whereas a metathetical analysis requires an "embarrassment of metathesis rules", McCarthy concludes that the former is, "at the very least, ... a plausible alternative" to the latter and can thereby "subvert the less restrictive (and therefore less desirable) theory incorporating metathesis rules."

While an approach exploiting stress shift as a rationalization for the facts of Clallam under consideration admittedly has a certain amount of plausibility, it nevertheless suffers from a number of serious flaws. Perhaps the least grave of these is the fact that stress shift works for suffixes only if the 'con-
trol' suffix has the underlying shape /ti/-even though its vowel shows up only in certain verbs in certain kinds of subordinate constructions. This hardly seems like the sort of evidence likely to attract the attention of "the language-learning child" so often discussed in the literature. Much more damaging, though, is the fact that the central element of a stress shift analysis--a morphological rule transferring accent from one vowel/syllable to another--suggests by its very name and nature that one kind of switch (a segmental metathesis) is just being replaced by another, suprasegmental switch.

Most important, however, is the following consideration. Although McCarthy does not integrate his suggestions concerning the actual aspect into an overall treatment of accentuation and vowel deletion in Clallam, his re-analysis can probably be made to work in such a way that, after stress is shifted, a single rule of unstressed-vowel deletion eliminates all the segments whose disappearance is required in order to create the surface appearance of metathesis. But his claim that a metathetical solution to the problem of Clallam actual-aspect forms requires unnecessarily many metathesis rules is completely undercut by the fact that his account needs a separate rule of stress shift for every rule of metathesis which he rejects. Thus, for example, a McCarthyan approach would require the Clallam actual aspect to be marked by a (morphological process (!) of) leftward stress shift for roots but rightward stress shift for suffixes (cf. the forms above).

In short, the case for morphological metathesis in Clallam is probably stronger than that for stress shift there; it is certainly at least as strong. And the example in question can only appear more robust when taken in conjunction with the similar morphological permutations which appear to exist
in the Australian, Austronesian, Penutian, and Semitic language families.

Given this body of evidence, it makes sense at this juncture to consider why Autosegmental Morphologists have been so vehemently opposed to morphological metathesis as to wage a virtual jihad against it. Their sole apparent motivation for this attitude is that morphological permutation requires the use of a transformational formalism—which, if unconstrained, is notoriously able to do literally anything. Indeed, going to the completely opposite extreme, McCarthy 1979/1982a, 1981 et seqq. has been concerned to uphold a constraint on morphological rules--variously called the "Morphological Transformation Prohibition (MTP)" and the "Morphological Rule Constraint (MRC)"--of the following sort (cf., e.g., 1981:405 [(50)]): "All morphological rules are of the form \( A \rightarrow B / X \), where \( A \) is a single element or zero and \( B \) and \( X \) are (possibly null) strings of elements. That is, ... [they] must be context-sensitive rewrite rules affecting no more than one ... [element] at a time, and no richer type of rule is permitted in ... morphology."

McCarthy 1981:405-406 motivates this constraint as follows: "...[A] theory that incorporates the MRC strongly generates a smaller class of grammars than a theory without this constraint. Morphological transformations potentially allow any arbitrary operation on a segmented string. For example, transformational morphological rules can freely move particular segments an unbounded distance within ... [a] word, copy all and only the vowels in a word, or reverse strings of finite length. If the segmental representation is further enriched by permitting integral indexing of segments, ... then morphological transformations can perform their arbitrary operations on only the prime or factor-of-twelve numbered segments in ... [a] word with no further enrichment of the formalism. These examples, though bizarre, are not
facetious. ...[A] morphological theory without the MRC allows all of these types of rules and in some cases values them more highly than morphological rules that actually occur in some language. A theory with the MRC is therefore significantly more explanatory than one without it."

Part of the above reasoning is clearly beyond any dispute—namely, that portion concerning the need for morphological theory to rule out seemingly bizarre types of word formation rules, ones of a sort qualitatively different from any real rules attested in natural languages. However, it is equally clear that a restriction like the MRC is not the only way to prohibit such processes. Another possibility is to impose a set of specific constraints which either disallow particular types of morphological rules or allow only certain types—or do both of these things. Such an alternative would, on the one hand, admittedly not be as unified and elegant as the MRC. On the other hand, though, this second approach can handle apparent rules of morphological metathesis quite easily, whereas the MRC requires such phenomena to be given usually rather circuitous and cumbersome reanalyses. The reason for this, of course, is that the MRC prohibits the transformational-permutative analysis of such processes—which is nearly always the most straightforward and elegant.

Furthermore, a perusal of the psychological literature on the general (and not just linguistic) string-processing abilities of humans fails to reveal any evidence of a widespread capacity among the general population to perform easily the types of "bizarre" operations mentioned by McCarthy. Thus, there is a second, even more plausible alternative to the MRC. If an overall theory of human cognition must rule out certain types of transformations on strings of symbols in general (i.e., for both linguistic and non-lin-
guistic tasks), then it is completely otiose and unwarranted to require morphological theory individually to prohibit a subset of such transformations. It is true that some rather surprising types of operations on phonological and morphological strings are employed in the speech-disguise games of the world's languages (for a survey, cf. Davis 1986-lecture). However, as stressed by Ferguson 1982:54-55, it is also the case that humans show a tremendous degree of variation in their abilities to utilize language game rules which is not at all matched by any appreciable variation in (non-aphasic) speakers' ability to manipulate the normal rules of their languages outside of linguistic play. Given this, it is clear that a morphological rule requiring skills not possessed by many members of a speech community has little chance of surviving even if someone does try to innovate it.

This last consideration regarding innovation brings up another historical factor which is relevant to the topic at hand. The response of Autosegmental Morphologists like McCarthy to such proposed replacements for the MRC as those given above has been to claim that even apparent rules of morphological metathesis are so crosslinguistically infrequent that they must be regarded as highly marked. But, first off, the absence of any psycholinguistic evidence suggesting that word-formational permutation is difficult to produce or perceive renders a claim like this essentially circular: morphological metathesis is said to be marked because it is rare, but such rarity is then attributed to its being marked. Furthermore, as argued by Janda 1984 and Hoeksema and Janda 1985, the regularity and productivity of morphological metathesis in a language like Rotuman provides suggestive evidence that such a phenomenon cannot be very marked, since it is there instantiated even in recent loanwords. But the strongest reason to resist
morphological metathesis is somehow marked comes from the possibility of giving a historical explanation for why such processes are relatively infrequent.

That is, as discussed at length in Janda 1984, it must be the case that all particular morphological phenomena which have not been passed down from the world's first language or languages have necessarily arisen via reanalysis. However, as also briefly mentioned above, the linguistic circumstances which can give rise to reanalyses with affixation and morphological replacement are frequently encountered, whereas those which can be reanalyzed as involving metathesis are few and far between (e.g., situations with phonological metathesis or with a combination of insertion and deletion). Consequently, it is actually possible to predict the relative crosslinguistic rarity of morphological metathesis without thereby claiming that such rules are markedly difficult to process in any way.

There thus exists a certain stand-off between the arguments in favor of the two general positions just adumbrated. To repeat: the first of these viewpoints is the Autosegmentalist one that morphological rules should be maximally constrained in a unified and elegant way, even at the cost of requiring a minimally supported fragmentary renalisis of putatively marked apparent morphological metathesis rules. The second perspective is that of process morphologists, in whose view it is most important to provide a maximally unified and elegant analysis for those morphological processes (like metathesis) that do exist, even at the cost of requiring general cognitive constraints or even specifically stipulated restrictions as a way to rule out non-existent types of morphological rules.
1.2.2. "Morphologically Conditioned Phonological Rules" vs. Proposed Constraints on Phonology.

Directly tied in with the currently unresolved controversy just discussed, though, are differing attitudes toward the overriding issue in the present chapter: whether or not linguistic theory should recognize morphologically conditioned phonological rules. To wit, in their desire to place maximal constraints on morphological rules, Autosegmental Morphologists (and in fact most non-processual morphologists) have indeed recognized the rule subtype in question, whereas advocates of process morphology have tended to reject such rules and instead treat them as just a subclass of the set of morphological rules. The nature of this other dispute can be made more concrete by considering the second example of at least partly morphological metathesis promised above—that from Akkadian, as based on McCarthy 1981:380-381 (who mentions but does not discuss a parallel process in Hebrew).

The Akkadian passive/iterative infix -t- sometimes but not always undergoes a certain permutation. This infix occurs in the so-called "Gt" (passive--and apparently also reciprocal) and "Gtn" (iterative) verb-derivalional classes of the language. Thus, corresponding to the root /m̄ḥs/ 'strike', there are the respective forms mitḥas 'be struck' and mitaḥḥas 'strike repeatedly'. Now, when the first root-consonant is a coronal fricative and is directly adjacent to the -t- infix, no changes affect the latter. Hence, from the root /šbt/ 'seize', the derived form for 'he will seize' is īstabbat, as would be expected. However, when the passive/iterative -t- infix is separated from a root-initial coronal fricative by a vowel, McCarthy 1981:381 reports that the two consonants "exchange positions by a metathesis rule".

40
Thus, also from the root /šbt/ 'seize', the infixed passive/reciprocal form /šibútu m/ becomes tišbutum by metathesis. And, from the root /zqr/ 'elevate', the passive form /zitqurum/ undergoes the same permutation and becomes tizqurum. Following McCarthy 1981:381 [(8)], the rule in question can be formulated roughly as follows (where "μ" indicates a morpheme):

\[
(8) \quad \begin{array}{c}
\left[ -\text{sonorant} \\
+\text{coronal} \\
+\text{continuant}
\right] \\
V \\
2 \\
X/ \\
4 \\
\Rightarrow /3 2 1 4/
\end{array}
\]

The process just given is obviously one of metathesis, and it also makes crucial reference to morphological information. A likely first impression would therefore seem to be that--like Clallam's permutations in the actual aspect--the Akkadian process, too, is a morphological metathesis rule. Nevertheless, even though McCarthy 1981:381 describes the operation in question as being "restricted to a particular conjunction of morphological circumstances", he elsewhere (1979:357/1982a:200) surprisingly refers to it as a "well-motivated ... phonological metathesis rule; ... the Akkadian ... rule [is] clearly not [a] morphological rule...". Yet not a single argument is advanced in support of this claim.

Most probably, McCarthy's reason for denying morphological status to the Akkadian -t- permutation process was that it does not serve to create the sole mark of a morphological category. Rather, it affects a segment whose presence in a form already represents the spelling-out of the relevant category there. Such operations are sometimes called "morphophonemic" or "morpho(phon)ological" and thus treated as a separate, unique type
of rule (like the "morphological rules" of Dressler 1985b; see also Dressler 1985c and references there). More commonly, though, processes like Akkadian metathesis are lumped together with indisputably phonological neutralization rules like English flapping or German final devoicing and so treated as just another kind of non-phonetic/non-allophonic phonological rule.

It is self-evident what the disadvantages are of an approach in which an ad hoc, orphan rule-type (= "morpho(pho)nology") must be created for morphologically conditioned rules that nonetheless do not constitute the sole or initial marking of any morphological category. Potentially more pernicious, however, is the approach which assigns such processes overall phonological, rather than morphological, status and so obscures the important differences in conditioning which exist between the two types of rules. This negative evaluation is based on the following simple but key consideration. The attempts of Autosegmental Morphologists and others to place severe restrictions on the form of morphological rules are empty accomplishments if phonology can be used as an unconstrained dumping-ground for processes that prove recalcitrant vis-à-vis proposed constraints on morphology.

It is true that McCarthy 1979a/1982a, 1981 has devoted some discussion to the possibility of constraining phonology via an appeal to naturalness (e.g., a "theory of natural metathesis"). Still, the evidence presented by Anderson 1980c/1981a and others regarding "Why Phonology Isn't [Completely] Natural" make the preceding suggestion an extremely unlikely possibility. Furthermore, if the phonologicity vs. morphologicity of Akkadian metathesis is in dispute, then the naturalness at issue here would seem to concern not so much the segmental environment and change involved as
the triggering morphological features [passive/reflexive] and [iterative]. And, in this regard, McCarthy 1981:406 readily concedes that "l'arbitraire du signe" makes it impossible to judge the association of morphological features with phonological ones according to "phonetically determined conditions of naturalness".

It must be concluded, then, that no justification has yet been offered for the continued postulation in generative grammar of "morphologically conditioned phonological rules". As already emphasized above, the mere fact that a process manipulates sound is certainly insufficient reason to label it phonological, or else much—if not all—of morphology, syntax, and the lexicon would have to be reassigned to the domain of phonology. On the other hand, the very act of proposing an alternative, processual approach to morphology presupposes an expectation that word formation should sometimes involve rules which perform the very same operations as do bona fide rules of phonology. Indeed, even if McCarthy were right in claiming that conditions of phonetic naturalness can be imposed on phonology, this would entail only that phonetically unnatural rules cannot be phonological; it would by no means demonstrate that all phonetically natural rules must be phonological.

After all, there have not as yet been any arguments adduced in the literature against the contention that the essential and crucial difference between phonological and morphological rules revolves around their differential conditioning. It is certainly not implausible to claim—as several generative phonologists and morphologists have already done (see Chapter IV below)—that only morphological rules may make reference to morphemes and/or morpholexical features (i.e., morphosyntactic, morphosemantic, or
arbitrary lexical ones). In the last analysis, any process which crucially and explicitly refers to a morphological element constitutes a mark of that element. And what else is the nature of morphology than to mark the presence of various syntactic, semantic, and/or lexical elements? On this view, even a second marking of a morphological category—as by Akkadian metathesis—must count as morphology, rather than phonology. Indeed, on a processual view of morphology, such multiple markings are not only to be allowed but even to be expected (cf., e.g., Matthews 1970, 1972b and Anderson 1977, 1981b/1982a). In this way, morphology is undeniably enriched, but the comcomitant way in which all putative "morphologically conditioned phonological rules" are simultaneously prohibited means that phonology is thereby constrained.

From such considerations, it emerges that a real dilemma actually does lie behind the current generative controversy over the two issues of "morphologically conditioned phonological rules" and the nature of formal constraints on morphological rules. On the one hand, those who have constrained phonology by denying that processes like Akkadian metathesis are phonological and by reanalyzing them as morphological rules are open to the charge that they have thereby weakened morphology. On the other hand, though, those who have constrained morphology by allowing morphologically conditioned phonological rules can legitimately be accused of having thereby weakened phonology. Clearly, this debate will not be settled by dogmatic appeals to preconceived ideas of what phonology and morphology are.

1.2.3. The Necessity of Constraining Morphology and Phonology Simulta-
neously—-and How a Rule Typology Can Do So.

It is the central contention of this chapter, however, that a resolution of the dilemma in question is possible. The crucial step involves recognizing that neither phonology nor morphology can be constrained in isolation from the other. Instead, they must be mutually and simultaneously defined and restricted. What is needed, then, is the elaboration of a typology involving the maximum possible number of conditions which differentially serve to identify phonological vs. morphological rules. That is, if a sufficiently large set of properties can be isolated which characterize uncontroversial phonological rules but not uncontroversial morphological ones—and vice versa—then it should further be possible to find cases where the properties under consideration have some bearing on rules whose status is in dispute. For example, it might be possible to find some formal or functional characteristics bearing on the type membership of a process such as Akkadian metathesis, which has variously been claimed to be a morphologically conditioned phonological rule and a tranformational-permutative morphological rule.

Several rule typologies of the sort in question have in fact been proposed in the course of the last decade. Most of these actually distinguish phonological and morphological rules not only from each other but also from a third category of phonetic (= allophonic) rules. One such typology is subjected to detailed exploration in the remaining chapters of this work—beginning, in the next one, with a further general motivation for sound-structural rule types. That is, whereas the present discussion has focussed on formal considerations involved in mutually constraining phonology and morphology, the next chapter shows how a rule typology is also motivated by issues concerning the phonetic content and the function of rules—especially
the way in which a given process may undergo a diachronic shift in status from one type to another. In so doing, that chapter also lays out the broad overall outlines of a complete evolutionary typology of sound-structural rules. Later chapters then fill in the specifics of its types, their origins, and their further evolution.

Before proceeding to such further general justification for a typology of sound-structural rules and to a presentation of the evidence which favors making it an evolutionary typology, however, it is appropriate to review and summarize the conclusions of the present chapter. Although it would clearly be invalid to claim that all linguistic phenomena which involve sound are phonological, generative phonologists have consistently posited "morphologically conditioned phonological rules" with no explicit justification and for no apparent implicit reason other than the claim just mentioned. In part, this situation has to do with considerations concerning the transition from American structuralist to generative phonology and with early developments internal to the history of the latter. Still, with the emergence of processual approaches to morphology and of lexically based morphology and phonology, it has become increasingly plausible—if not probable—that morphologically conditioned processes of metathesis, deletion, and substitution which were formerly assumed to be phonological are actually morphological rules.

Most importantly, the lack of serious consideration and exploration devoted to this possibility by generative grammarians has prevented them from adequately constraining either phonology or morphology. And this result has come about largely because phonologists and morphologists have tried to restrict each domain independently of the other, whereas in reality the two sets of rules can only be constrained mutually and simultaneously.
To this end, however, there is a need for a typology encompassing all rules of sound-structure: especially those of morphology and phonology, but also those of phonetics. With a sufficiently rich typology based on a large number of defining and distinguishing properties, though, it becomes possible to decide the question of whether or not there exist morphologically conditioned phonological rules.

In the following pages, a particular rule typology which has been proposed for sound-structural rules is considered, compared, adopted, modified, and defended. The emphasis throughout is on scrutinizing the characterization and motivation which have previously been offered for it. In some few respects, the typology must be strengthened by reducing its scope. In numerous other respects, though, both its scope and its validity can be extended considerably beyond those of earlier proposals (and counterproposals). The motivation for a specific as well as a general evolutionary typology of sound-structural rules, that is, turns out to be quite strong. And the particular typology in question is in fact one which rejects the notion of "morphologically conditioned phonological rule" and instead recognizes morphological rules that perform such quasi-phonological operations as metathesis, deletion, and substitution. Only in this way does it prove possible adequately to constrain morphology and phonology vis-à-vis one another—to render unto meaning what is meaning's, and unto sound what is sound's.
FOOTNOTES FOR CHAPTER I

1 For a representative sample, see Appendix I immediately following, which cites twelve examples separated by one-, two-, or at most three-year intervals over a period of nearly three decades.
APPENDIX I

Representative "Morphologically Conditioned Phonological Rules" Implicit or Explicit in the Generative Literature from 1960 to the Present

(1) Chomsky and Halle 1960:275, 280 [(20)-(21)] state that a "grammar must ... include an account of the phonetic properties of utterances; that is, a set of rules that contain information on the pronunciation of utterances, their phonetic structure, and so forth...[--]which we call the 'morphophonemic' rules of a language." For English, these rules include, in addition to rule (21)--[tY, dY] → [t, d]--also rule (20) below, where "in env." means 'in the environment of' and where affixes are introduced by hyphens. The second part of the process in question deletes i in the derivation of, for example, racial (but not, e.g., in that of radial).

\[
\begin{align*}
\{ & y \rightarrow \emptyset \text{ in env. palatal } (+) \\
& i \rightarrow \emptyset \text{ in env. palatal } + + + \{ -al, -ous, -ent \}
\end{align*}
\]

(2) Chomsky 1962:533-534/1964a:948-949/1964b:88-89/1964c:71-72/1972a:404-405 [(23)] observes that, "in ... English grammar..., ... the phonological component contain[s]... the [following] rule... (23), ... ['as in 'abuse' -- 'abusive...']":

\[
z \rightarrow s \text{ in the context: } + + -iv
\]

"Note that th[is]... rule... should properly be stated strictly in terms of features. Thus, ... rule (23) should assert, simply" (p. .../90n.39/73n.12/405n.12):

\[
[+\text{Continuant}] \rightarrow [-\text{Voiced}] \text{ in the context: } + + -iv
\]
(3) Zwicky's 1965 *Topics in Sanskrit Phonology* presents "a number of sandhi rules that account for alternations in aspiration and a number of rules that account for voicing assimilations" (p. 109)—namely, "...[t]he rules grouped into a set... [with the] mnemonic tag... AV: aspiration and voicing" (p. 23). "The final form of [one such AV rule,] Grassmann's Law" ("AV2 (= GL")", p. 118), is as reproduced below (where "cont" = 'continuant', "tns" = 'tense', and "BND" = 'boundary'—which is relevant because "#... has the unit marking +BND where other segments have -BND" (p. 26). By this well-known rule, an underlyingly diaispirate root like /bhudh/ 'know' loses its initial aspiration and becomes [b u d h] (unless some other rule has already deaspirated the final root-consonant).

\[
\begin{align*}
[-\text{cont}] & \rightarrow [-\text{tns}] / ____ [+\text{cont}]_1 \\
&& \left[ \begin{array}{c}
[-\text{cont} \\
+\text{tns} \\
+\text{ROOT} \\
-\text{BND}
\end{array} \right]
\end{align*}
\]

(4) Chomsky and Halle 1968:136 argue that English alternations like *apothecary* vs. *anniversary* can be accounted for with independently motivated rules of "Stress Adjustment ... and ... Tensing, except that we must also add a subsidiary Laxing Rule to change [(tense)] [A] to [(lax)] [e] in -ary.... The rule will apply only to the element[(s)] -ary, thus distinguishing the phonetically lax ... [here underlined] vowel of ... apothecary... from the phonetically tense ... [here underlined] vowel of area, ... and so on." Also (p. 202), "...[s]ince a form of laxing is involved [here], it is reasonable to combine this [process] with the [Trisyllabic] Laxing [rule complex]..., as a special case." The final form of this process of "(20) Laxing ... II" (*SPE*: 240-241; cf. also its brief mention already here in Section 1.1.1 of the main text above) essentially has the (full) structural description "/ + Ar + i (+, #)".

50
since Chomsky and Halle formulate the rule as follows (where "seg" = 'segment'):

\[ V \rightarrow [-tense]/+ r_i [-seg] \]

(5) Kisseberth 1970 (after Kisseberth 1969, Kuroda 1967, and--ultimately--Newman 1944) discusses as among "the phonological processes ... of Yawelmani" (p. 293) a "rule of vowel deletion which affects verbal suffixes of the shape CV which appear in word-final position. For example, the imperative morpheme is -k\( \text{a} \) when suffixed to a consonant-final stem: xat\( \text{k} \) 'eat!', but -k\( \text{a} \) when suffixed to a vowel-final stem: taxak\( \text{a} \) 'bring (it)!" (p. 302 [(10)]). Kisseberth 1970:304 [(10')] later reformulates this rule--unfortunately, with a typographical-erroneous omission--so as to reflect the effects of a particular "derivational constraint" of Yawelmani (namely, *CCC, *#CC, *CC#), but both of his formulations refer to the partial environment "in verbs". Kisseberth’s first, standard formalization of the process in question is as follows:

\[ V \rightarrow \emptyset / V + C \_ \_ \_ \_ \# \text{Verb} \]

(6) Schane 1973:107 suggests that "...[w]e can ... allow syntactic features to appear along with syntactic categorization in phonological rules. The following rule for Spanish states that the vowel immediately after the stem [of a verb] (i.e., the conjugation vowel) is stressed in imperfect tenses" (as in, e.g., cantaba 'l/he/she/it was singing'; cf. pp. 104-107):

\[ V \rightarrow [+\text{stress}] / X \text{Verb} \quad + + \]

\[ \text{[+past]} \quad [\!-\text{perfect}] \]
(7) Brame and Bordelois 1974:296 [(28)] present a (restatement of a) "Raising" rule in order to account for Spanish vowel alternations like the following ones in the verbs comer 'to eat' (with theme vowel /e/) and dormir 'to sleep' (with root vowel /o/ and theme vowel /i/): preterite first-person plural comimos ([komì'mos]) and third-person singular durmió (< /dormìr+ǐ-o/) and present-subjunctive first-person singular dormamos ([dur'mà'mos]).

Using the conventions that "the feature [+S] is proposed by Harris [1969] to distinguish between first and second conjugation vowels that undergo diphthongization and those that do not", that "pres" = 'present (tense)', and that "syl" of course = 'syllabic', Brame and Bordelois formulate Spanish Raising as follows (unfortunately thereby overlooking the fact that their rule's specification [-pres], intended to block incorrect present-tense raisings like indicative first-person plural comemos → *comimos, also blocks correct raisings like that needed for those verbs, such as pedir 'to request', which have root vowel /e/ and theme vowel /i/-cf. indicative first-person singular pido/*pedo):

\[
\begin{array}{c}
\left[\begin{array}{c}
+\text{syl} \\
-\text{low} \\
+\text{S} \\
-\text{pres} \\
\end{array}\right] \\
\left\{ \left[\begin{array}{c}
+\text{stress} \\
\text{CV} \\
\end{array}\right] \right\}
\end{array}
\]

\[
\begin{array}{c}
\left[\begin{array}{c}
\text{low} \\
\text{high} \\
\end{array}\right] \\
\end{array}
\]

\[
\begin{array}{c}
\left[\begin{array}{c}
\text{C0} \\
\dot{\text{a}} \\
\end{array}\right] \\
\end{array}
\]

(8) Guerssel 1977:271-272 discusses as an "argument in support of a sequential representation for geminates ... the deletion of the prefixal vowel of a noun when the noun is in the construct state. In Berbei, a noun is said to be in the construct state if it is the subject of a verb and follows it or if it is the object of a preposition." Thus, for example, the underlying "Construct[-
state form] /t+a+mallal+t/ 'egg' is changed by Construct Deletion into [t+mallal+t] and eventually surfaces with the "Phonetic Shape" [tmallalt] (cf. Guersssel 1977:272 [(21)]). "...[A]ll construct state nouns are [presumably] marked [+constr]. This feature is clearly predictable in terms of syntactic contexts as shown in Guerssel [...1976], and it may well be that the rule proposed here is to be stated in terms of syntactic contexts. But these issues of a more syntactic ilk have no consequences for the basic phonological points to be developed here.... The rule of Construct Deletion can be stated as follows:

\[
\begin{align*}
\vdash +\text{construct} \rightarrow \emptyset /\_+ \\
\end{align*}
\]

(9) Gussmann 1980 has as the first item in his "cumulative list of ... phonological rules" for Polish a process ("DI Tensing", p. 133 [(1)]) which tenses vowels in derived imperfectives (DIs). This rule is intended to account for alternations like, for the verb 'close', non-imperfective za[mk]ńa vs. za[mk]aja 'DI'-in that the underlyingly lax root-vowel here is deleted (by another rule) unless that vowel becomes tensed when its root is derived as an imperfective. Correcting an oversight (the omission of "C_0") in some of Gussmann's various revisions of Polish DI Tensing (cf. pp. 38-40 [(69)] vs. pp.74-75 [(127)]), we can here give that rule as follows (where "syll" of course = 'syllabic' and -aj- is a DI suffix):

\[
\begin{align*}
\vdash \text{syll} & \rightarrow \text{tense} \\
\vdash \text{<-high> } & \rightarrow \text{<-low> } /\_C_0 \text{ aj }_\text{DI} \\
\end{align*}
\]

(10) Lapointe and Feinstein 1982:86 [(30)] (after Kuroda 1967) propose an epenthesis process for Yawelmani which breaks up final consonant
clusters in verb stems when they are followed by a consonant. Those authors formulate their "morphologically restricted [phonological] rule" of "Stem-final Epenthesis" as follows (where the subscript "V" here = 'Verb', while "S" = 'Stem'):

$$\emptyset \rightarrow i / X C \_\_ C | V S C Y$$

(11) Halle and Mohanan 1985:76-77 [(56)] propose the rule of "Shortening" reproduced below in order to account for English shortenings (née--in SPE-laxings) like those in sanity (vs. sane), intervention (vs. intervene), and satiric(al) (vs. satire). (In their rule formalism, "X" stands for "a core skeleton ... (timing) slot..." (cf. p. 73), "σ" = 'syllable', "R" = '(syllable) rime', and "cons" of course = 'consonantal'.)

![Diagram](image)

(12) Halle and Vergnaud 1987:72 (in a reanalysis taking off from Chung 1983) suggest that "the most interesting part of Chamorro phonology" involves, among other processes, a "...segmental rule... of ... gemination ... that closes the syllable [in a word] bearing main stress and is triggered by a small number of word-final suffixes listed by Chung [1983]... all of which are of the form CV in their underlying representation." Cf., e.g., déddigu 'heel' and déddigómmu 'your heel' vs. hígadu 'liver' and hígadúña 'his liver'. The fullest version of the Gemination rule given by Halle and Ver-
gnaud 1987:72 [(56)] is the following ("state[d] informally"): 

Geminate the initial consonant [in any] of certain [ (= "a small number of") ] word-final suffixes [ ("all ... of the form CV in their underlying representation") ] if the suffix adjoins a vowel-final stem and if the stem contains a stressed closed syllable.
CHAPTER II
Using an Evolutionary Typology to Explain Phonetic Substance, Phonetic Similarities, and Change of Type Among Sound-Structural Rules

II.0.

Whereas the preceding pages emphasized the utility of a sound-structural rule typology for purposes of elaborating formal constraints on morphological and phonological processes (and, by extension, phonetic ones), the current chapter discusses how endowing such a typology with an evolutionary dimension gives it explanatory power in matters concerning phonetic content. An evolutionary rule typology, that is, has a unique potential to account for—and hence constrain—the range and patterns of phonetic substance found in sound-structural processes, both language-particularly and universally. Furthermore—but relatedly—a typology of this sort can begin to provide explanations for the phonetic similarities that often exist between rules of different sound-structural types (e.g., phonological vs. morphological Umlaut rules). Perhaps most importantly, though, only an evolutionary typology is adequate for the likewise related task of explaining how and why sound-structural rules often change in type (whereby Umlaut is once more a relevant example).

Toward the goal of addressing these and other issues, this chapter first treats the issue of phonetic content in sound-structural rules overall, at a somewhat abstract level. Especially significant here is the fact that predictions and constraints in this area cannot be developed without a typology that both interrelates different kinds of processes and furthermore does so
with reference to diachrony. There then follows a discussion of why rule typologies and rule evolution between types have not seriously been considered until recently, even though similar ideas were prominently advocated in the nineteenth century. Finally, the general notion of an evolutionary rule typology is given concrete exemplification and characterized as the major mechanism governing and expressing the "lifecycle" of sound-structural processes.


The preceding chapter dealt primarily with sound structure--i.e., phonetics (briefly), phonology, much of morphology, and certain aspects of the lexicon. However, it also seems entirely appropriate to situate the present enterprise within the larger framework of general linguistic theory. As regards the goals of that theory, it can fairly be said that most linguists conceive the ultimate purpose of their discipline to be that of explicitly and insightfully characterizing the phenomenon "human language". However, there exist two significantly different attitudes toward just what the concept "human language", as the focus of linguistic research, should be taken to mean.

One approach regards this notion as being more or less synonymous with "the entire range of phenomena that constitute particular existing (or previously existing) human languages". Here, the relevant range of facts may be taken to include the mental representation of linguistic data in each speaker's head, in the form of a "grammar"--an entity that also ultimately has to do with the production and perception of such data. The other major viewpoint, however, is that "human language" should be considered synon-
ymous with "possible human language". This interpretation brings into the
purview of linguistics, not only the phenomena of all existing languages, but
also the entire range of data in possible languages. The crucial point here
is that, while the latter have, to be sure, never been spoken or known by any
human, they are entirely within the set of possibilities allowed by the gener-
al language capabilities residing in each normal person's brain (what can
be called "Universal Grammar" [UG]).

I will not expatiate, here, on the two abovementioned general approach-
es to the proper object of linguistic study. (For some recent discussion and
references, however, see Chomsky 1980, 1981 and the works cited there.)
My purpose in introducing them into the present context is only to show how
they each entail a correspondingly different conception of the task and
scope of phonology within overall grammar. Thus, one attitude toward re-
search on sound patterns in language is that attention should be concen-
trated on, if not confined to, attested phonological phenomena--those found
in particular languages spoken either presently or previously. The other
major view is that phonology should strive to characterize the notion "possi-
ble sound pattern of a natural language"--and in the widest conceivable
sense.

In practice, it may well be the case that most current phonologizing is
done in the spirit of the former approach, even within current generative
phonology (GP). One must, after all, admit that we are forced to remain diffi-
dent about analyses of the sound systems of even the most thoroughly
studied and best-described languages. Furthermore, it is probably true that
a sizable portion of the world's languages (not to mention dialects) are still
awaiting their first rudimentary reliable descriptions. As a consequence,
one certainly cannot find fault with those phonologists whose work focuses solely on the analysis of actual sound patterns in present and past languages. If their research is not an end-all, it is at least a crucially important foundation for the theorizing done by proponents of the second abovementioned approach.

But this other focus--on elaborating a universal theory of possible linguistic sound structures--is perhaps to be detected as a guiding force behind the writings of more phonologists than one would at first believe. Such a "potentialist", universalist goal was, for example, originally intended to be a major part of the so-called "Standard Generative Phonology" (SGP) expounded in Chomsky and Halle 1968 (SPE). Since many approaches to phonology since 1968 have retained Chomsky and Halle's goals--despite radically altering some of their theoretical and methodological assumptions--it must follow that such new directions of research continue SPE's focus on possible sound patterns.

However, as regards not the form but the content of phonological patterns (especially rules), it must be conceded that the most avowedly universalist and potentialist aspect of SGP--the theory of "markedness"--was probably one of the least employable and employed parts of that whole general line of research. (For discussion, cf. Anderson 1974c, 1979a, 1979b/1980b, and references there.) As a result, the emphasis of most recent phonologizing has (with a few exceptions like Kean 1975/1980) been much more on the insightful characterization of existing sound systems in individual languages and on crosslinguistic comparison of such attested patterns. To aim for a theory of phonology that would do more than this might seem, at the present time, to be a premature goal, if not an errant or impossible
Nevertheless, it is the overall contention of the present investigation that substantial progress toward characterizing the notion "possible sound pattern of a natural language" can be achieved--namely, through the adoption of a particular research program for the investigation of sound structures (=, again, those of phonetics, phonology, morphology, and/or the lexicon). This work, as a whole--and this chapter of it, in particular--will attempt to show that employing for sound structure the concept of an "evolutionary rule typology" (or "lifecycle of rules") must, in principle, lead to a greater understanding of the range of the phonetic, phonological, morpho(phonolog)ical and (phon-)lexical variation possible in language.

The research program in question represents the synthesis of a number of seemingly disparate approaches to phonology, from both this century and the last, but its chances of success arguably are considerably better than those of any of its components taken individually. And the reasons for the advantages which accrue to this project and the theory behind it are ones having largely to do with its being an integration of synchrony and diachrony--a synthesis that allows those two aspects to complement each other while it simultaneously affirms their distinctness.

Since the use of historical considerations in accounting for synchronic sound patterns may initially appear somewhat suspect, I will next present the case for the possibility--indeed, the necessity--of incorporating diachronic information into such an enterprise. Let us first leave the realm of linguistics, for a moment, and consider any arbitrary phenomenon of type $X$ whose tokens $(X_1, X_2, ..., X_n)$ can be rigorously grouped into various subtypes $(X_1', X_1'', ..., X_N')$ on the basis of certain shared properties of those $X$
tokens. Now, suppose that the following three things are known in their entirety: (1) all of the possible sources \(x_1, x_2, ..., x_n\) for \(X\) tokens (= for \(X_i\)'s--i.e., what other entities can turn into them, and how they do so); (2) the properties of (the members of) each subtype of \(X\), and (3) the conditions under which members of one subtype \(X_j\) can change into members of another subtype \(X_k\). If all this is known, then it must inevitably follow that one should be able to predict the entire range of phenomena subsumed under \(X\).

On the basis of such information, that is, one will be able to predict, for example, all of the possible \(X\)'s that a potential source \((x_i)\) can become, even if no such \(X\)'s exist at the moment of prediction. For any existing \(X\) that one chooses, one will also be able to determine its subtype \((X_1)\)--on the basis of its properties--and vice versa. And one will then additionally be able to establish how this \(X\) (with its properties) could change, in the future, to become a member of a different subtype. All of this analyzing and predicting can, therefore, clearly be achieved--but only given reference to historical considerations, to possible changes over time: from token \(X_i\) to \(X_j\), and from membership in type \(X_j\) to that in \(X_k\). However, such results cannot, in fact, be obtained if historical information is excluded. If one's data are restricted to existing \(X\)'s and their membership in the various subtypes at a single point in time, or even at several points in time, then one has no way to predict the possible future existence and nature of other \(X\)'s. This latter step can be taken only on the basis of knowledge about the various origins of \(X\)'s and about their potential for further development.

Since the above conclusion must hold for any arbitrarily chosen phenomenon, though, it must consequently hold for sound patterns in human
language. And this means that the necessary ingredients for a predictive theory which will characterize the full range of possible variations in linguistic sound structure are the following three: (1) an inventory of the possible sources for sound alternations; (2) a typology of rules of sound structure (= of phonetics, phonology, morphology, and possibly also the lexicon) specifying the properties associated with each rule type, and (3) a set of conditions governing the mechanisms by which rules can change their nature and type.

But it is a known fact that sound patterns do appear to have sources, that such patterns apparently are subsumable under various types of rules of grammar, and that they can change in type. (The evidence for the factuality of all these assumptions will be dealt with at much greater length in Part Two of this work.) It would thus seem to be a simple matter of logic that a theory of the sort just sketched must, in principle, be capable of defining exactly the full range of potential sound variation in natural languages. And, in the absence of any other easily imaginable way to achieve this goal, it appears that an evolutionary rule typology in fact represents the only explanatory construct currently available for dealing with phonetic variation, phonetic (as well as formal) similarities, and change of status between and among different sound-structural processes.

II.2. Reasons for the Long Previous Neglect of an Evolutionary Rule Typology (ERT).

The goal of characterizing the notion "possible sound pattern of a human language" is precisely the one earlier described here as being pursued by a substantial number of current phonologists, if not the majority of
them. Hence, one is tempted to ask why the abovementioned three-pronged approach to that task—one involving an evolutionary rule typology (ERT) for sound structure—has not been conspicuously employed until the past decade or so, since it would appear practically to guarantee success. There are a number of responses to be made to this query.

First, it should be emphasized that a theoretical stance remarkably similar to the one just sketched actually was adopted and seriously pursued in the late 19th century by a handful of individual linguists. But the prevailing linguistic climate of the time was, of course, the Neogrammarian doctrine of exceptionless sound laws (cf., e.g., Wilbur 1972, Jankowsky 1972, Kiparsky 1974, and the papers in Wilbur (ed.) 1977--especially Wilbur 1977). Thus, the foresight of such figures as Mikolaj Habdank-Kruszewski (1851-1887), Jan Ignacy Nieciszew Baudouin de Courtenay (1845-1929), and Hugo Ernst Mario Schuchardt (1842-1927) can only be characterized as extraordinary. While other scholars, in their treatments of phonology, were focusing virtually single-mindedly on diachronic correspondences between individual sounds (or sound classes), these men developed an embryonic notion of synchronic phonological rules (at least, of such generalizations) and sought to elaborate a theory of the diachrony of such entities in rule evolution.

It would take an entire book to do full justice to the visionary achievements of Kruszewski, Baudouin (de Courtenay), and Schuchardt, so I will limit myself here to giving only a general characterization of their significance. As argued by (among others) Jakobson 1929/1971a, 1960/1971b, 1965, Stankiewicz 1972, Koerner 1972, Kilbury 1974, 1976, Klausenburger 1977/1978a, 1979, and Anderson 1985, it was Kruszewski who first analyzed the alternations in the sound structure of languages as evidence for
sound-structural rules (better: relations) of various types—phonological and morphological—and first proposed a theory governing the evolution of particular rules from one type into another. These ideas are all contained in Kruszewski 1881/1978, but their further refinement by that author was stopped by his later neurological illness and lamentably early death in 1887 at the age of 36. Baudouin, whose teachings had first led Kruszewski to the aforementioned conclusions, later pursued the same approach himself—especially in Baudouin de Courtenay 1894, 1895/1972, where he particularly stressed the phonetic ("anthropophonic") origin of alternations.

During the time between the publication of the last-mentioned works, Schuchardt 1885/1972 had meanwhile published his famous attack on the Neogrammarians. (For a concise treatment of Schuchardt's life and overall work, see, again, Wilbur 1972). As argued by Vennemann 1972b, Schuchardt also clearly employed a concept of "synchronic phonological rule", and he envisioned such rules as potentially changing their status over time. In attributing to alternations a definite directionality (essentially, from basic to derived sound), he even exceeded the two Poles Kruszewski and Baudouin in anticipating major aspects of future generative phonology (GP). (Still, for a much fuller discussion of Kruszewski and Baudouin as forerunners of GP, again see Anderson 1985.)

In any case, though, the prematurely synchronic and rule-oriented focus of all three of these linguists’ work was sufficiently anachronistic that it found virtually no resonance during their active careers or even during their entire lifetimes. It would be wrong to attribute too many current phonological tenets and ideas to any of these figures, but, in at least some aspects of their work, they prefigured SGP. And, in their integration of synchrony and
diachrony by means of a theory concerning the evolution of (types of) rules, they even outdid SGP.

But the more than three quarters of a century that separate us from the relevant writings of Kruszewski, Schuchardt, and Baudouin saw no significant attempts to take up their ideas about types of rules and their evolution. This was due partly to the extreme psychological orientation of all three men's linguistics, which was too strong even for Trubetzkoy (cf. 1939/1949/19582/1969 regarding Baudouin), who was himself considered rather mentalistic by many American structuralists. But the neglect accorded those rule-typological and rule-evolutionary pioneers was due mostly to the general adoption of the Saussurean dichotomy (cf. de Saussure 19161/19313/1959) between synchrony and diachrony, which for many years was seriously challenged only by a few loners like Jakobson (1931/1949/1962a/1972/1978). Furthermore, given that the focus of earlier phonological analysis was on representations rather than on rules, even the synchronic aspect of an evolutionary rule typology was doomed to relative neglect.

It is admittedly true that, even during the heyday of American structuralist phonemics, virtually all analysts assumed some form of translation between phonological and phonetic representations. But, with this relation limited by most or all of the extremely restrictive conditions discussed and criticized by Chomsky 1962/1964a/1964b/1964c/1972a, the rules thereby implied received almost no discussion. Further work on rules, their types, and their historical development had to await the GP revolution. (On this point, cf. especially Anderson 1979a, 1985.1)

It was not really possible for phonologists to discuss a rule typology of
any kind, then, until roughly the last three decades. But an evolutionary rule
typology—hence a historical one—has become possible only even more re-
cently. The tradition of excluding diachronic considerations from the task of
accounting for synchronic language patterns was broken with, in general
and other current American linguistics, really no earlier than circa 1974.
During the late seventies, though, there took place a snowballing resur-
gence of adherence to the belief that diachrony can play a role in the actual
explanation of synchronic grammatical phenomena.

Kiparsky 1975, for example, argued this point at length for general
linguistics, and Lightfoot 1979 adduced similar arguments regarding the
relation of diachronic syntax to synchronic syntactic theory. And, from a
quite different perspective, Greenberg 1977/1979 presented evidence that
it was time for "Rethinking Linguistics Diachronically". There thus exists a
strong recent precedent for invoking diachronic considerations in order to
explain the full range of synchronic linguistic phenomena (cf. also Janda
1984). But I should immediately state that my purpose in citing this trend is
not to provide the sole justification for including history in an evolutionary
rule typology intended to define the range of possible sound patterns in hu-
man language. Rather, I wish only to establish the prior plausibility of this
analytical and theoretical tack—so that the present study is, in fact, itself in-
tended to help justify such arguments and conclusions as those just men-
tioned above.

I have now provided a history-of-linguistics context for the historical
component of the concept "evolutionary rule typology" (ERT), thereby ex-
plaining why the concept almost died aborning, through neglect or hostility,
and why it could not really be revived until recently. I would next like to ad-
umb rate the current status of the overall idea of an ERT, as an "amphichron-
ic" (= both synchronic and diachronic) whole, in contemporary phonolog-
ing. In order to do this, it is necessary both to review exactly what, in gener-
al, is involved in such an ERT--what can be called a "lifecycle of rules in
sound structure"--and also to flesh that notion out somewhat.

I suggested above that the three crucial ingredients for an evolutionary
rule typology are: (1) an inventory of the possible sources for sound-struc-
tural alternations; (2) a typology of rules of sound structure (= in phonetics,
phonology, morphology, and the lexicon)--one specifying the properties as-
associated with each rule type, and (3) a set of conditions governing the proc-
esses by which rules can change their type. It should be clear, here, that
(2)--the rule typology--is, in a very significant sense, the linchpin of this en-
tire project. (1)--the catalog of sources for alternations in sound structure--
is, of course, a crucial element, but it does, after all, represent only the low-
est level of the rule typology: roughly, the set of possible origins for strictly
phonetic rules. And (3)--the body of conditions on change in type--obvious-
ly serves mainly to elucidate the relationships between certain rules of dif-
ferent types. Hence, as it were, (1) "feeds" (2) with the necessary input,
while (3) operates on elements of (2), thus governing their transition from
one of (2)'s subparts to another.

A typology of rules of sound structure, then, is the background against
which the origin and evolution of such rules takes place. But the impor-
tance of the principles governing the first appearance and the metamorpho-
sis of rules should not thereby be underestimated. If our goal is eventually
to predict the entire range of possible alternations in the sound structure of
human language(s)--as I have suggested that it can be--then it is not
enough to know simply what the general types of rules are and what properties of form, application, and ordering each type has. This is because a rule typology alone will not allow us to characterize the possible phonetic substance of different potential alternations. Nor will it reveal all the existing constraints that govern alternations (especially constraints on what their substance can be) if certain of these restrictions are due to particular conditions on rule evolution. Hence, all three parts of the evolutionary rule typology are crucial to the achievement of the goal that we have set ourselves.

Knowing this, one may then ask which current phonological theories (or approaches to phonological theory) provide the wherewithal to cover the whole trio of the typology's parts. The short answer to this question is that, unfortunately, out of a total of more than ten, only within four major current approaches to phonology have there been proposals expressly advocating the elaboration of something like an overall lifecycle of sound-structural rules. And, of these four, only within one has the central aspect--the rule typology--been given the beginnings of a sufficient empirical foundation. Fortunately, however, this one approach not only seems to be a promising basis on which to found an evolutionary rule typology but also happens to be a version of the presently best-known and most elaborated theory: current generative phonology (GP).

Therefore, in the rest of this chapter, I will forbear from sketching the existing outlines of the general phonological theory in question--and especially from fleshing it out at all, since the relative familiarity of present GP makes this unnecessary. Rather, I will reserve for Appendix II (to this second chapter) a discussion of that theory and of my abovementioned assumption that other contemporary theories are, indeed, less adequate bases for elaborat-
ing the proposed lifecycle of sound-structural rules. (My remarks in that Appendix are not by any means intended to imply the deficiency of these theories in the absolute—although some of them may well be thus deficient; their mutual criticisms certainly seem to suggest this! Rather, their relevant deficiencies here involve only inadequacy relative to a certain purpose, to a particular proposed extension of phonological theory.) Consequently, I will next present only a general consideration of the place occupied by an evolutionary rule typology within a certain version of current GP. The specifics of the ERT favored here and of the GP theory in which it is intended to be embedded are then explored in the following chapters, which together form Part Two of this work.

II.3. An Evolutionary Rule Typology (ERT) as a "Lifecycle" of Sound-Structural Rules.

The intuitive basis of the evolutionary rule typology to be developed here corresponds to the general feeling about the "lifecycle" of sound-structural rules that any linguist is likely to have who has ever dealt in depth with the phonology of several stages of a single language. (On this general notion, cf. also, e.g., the works of S. Anderson, some of which are quoted in Appendix II below, but especially the explicit use by J. Anderson and Jones 1976 of the term "life cycle" for the overall process in question.)

The intuition at issue is roughly that, at one stage, a given alternation is often absent from the grammar of a language (either entirely or because it is unrecognized or else mechanical and hence non-linguistic), while later stages may show the alternation present but in different guises: first, as a low-level phonetic rule (or allophonic regularity); later, as a phonological rule
(or phonemic distinction); still later, as a morphologized and hence morphological (or else lexical-class-conditioned) process, and, finally, as a mere isolated lexical correspondence. Eventually, the alternation may be lost (except perhaps as a mechanical phenomenon) or become unrecognizable to anyone save an etymologist and, in a sense, will thus have returned to nothingness. Given that pre-birth and death are often equated as states of nullity from or into which organisms pass, a comparison of the linguistic development of sound alternations with the biological lifecycles of organisms suggests itself rather naturally. 3

Throughout this work, I will presuppose that alternations entail the existence of corresponding rules, and so I take the lifecycle in question to be actually that of particular rules. This lifecycle can be represented diagrammatically as below, where the stages are general rule types which will shortly be defined and made precise (in a later chapter), while the transitions between them (discussed in a different later chapter) represent general processes of change in rule type familiar from works on diachronic structuralist or diachronic generative phonology. 4
One aspect of the development of such linguistic rules which reinforces their parallel with the birth-to-death lifecycle of organisms is the fact that neither really originates from nothing. There is always something, some substance, that gives rise to the "life" of an organism or a rule. Another such shared aspect is the fact that, usually, neither cycle really ends in nothing: the substance that constituted an entity or alternation may lose its identity as a recognizable unity, but it need not cease to exist entirely.5

Let us take a familiar sort of linguistic alternation in order to exemplify the idea of a sound-structural lifecycle. In Old (or Pre-Old) English (OPOE), palatalization of velar consonants took place in an environment very rough-
ly characterizable as before and after front vowels. Such assimilation is thought to have given rise to variation like that between [k] and [kn]—as, respectively, in 'to bake' *bakan ~ *bæk̪će (presumed) 'batch' (cf. POE *bækkə). It is assumed that this process began as the exaggeration of a coarticulation effect which happens because it is, in fact, nearly impossible to avoid. (On the POE origins of this process, cf., e.g., Cassidy and Ringler 1891/19713.) But then the degree of palatalization involved here was, in the course of the history of English, increased to the point where [k] eventually alternated with [č]. More significantly, the palatalization/palatality of the relevant alternants was retained even when the conditioning vowels disappeared or changed—as for the initial sound of OE čælce > Modern English (NE) chalk, which clearly shows the rule to have become non-productive in its earlier state of conditioning. That is, before or after front vowels, English now has words with /k/’s that are not—i.e., do not become—[č]: e.g., cape, ache, cake, etc.

The rule responsible for the bake ~ batch alternation, then, did not arise ex nihilo, but grew out of an existing aspect of pronunciation which is presumably universal. That is, speakers of languages can, it is true, produce a phonetically (and also phonologically/underlyingly) non-fronted/non-palatalized velar consonant before a phonological/underlying front vowel if the initial part of the vowel is realized with phonetic velarization (as, e.g., in Russian). But it is undoubtedly physically impossible to pronounce a phonetic velar in the environment of an adjacent phonetic front vowel without some slight degree of fronting or palatalization—at least during the relevant intersegmental transitions. Thus, this universal, mechanical effect was, in effect, not originally a rule of English (in the sense of having to be learned
as a fact about the grammar of the language. Once in existence as a slightly exaggerated aspect of the articulation of phonetic-front-vowel-adjacent velars in Old English, however, such palatalization was free to develop--to be developed by speakers, that is--into a morphological/lexical regularity (apparently bypassing the phonological-rule stage--more on this presently).

And, today, it is unlikely that many speakers of English conceive of bake ~ batch as morphologically related in a way parallel to, say, sane ~ sanity--so that the original rule of palatalization has essentially been completely lost. (A further "lost" alternation of the type in question is cool ~ chill < OE cōl ~ ċ(i)ele). The "palatal" segments (i.e., the palato-alveolar affricates) that the earlier rule produced remain, but they are now facts about individual words, not about certain morphological or lexical classes--and certainly not about the sound structure of English in general. It is in this sense that, as a rule, OE palatalization has disappeared--has returned to nothingness. (This is especially true in the sense that NE and in fact presumably all stages of English have always had some slight subphonetic palatalization of the kind here in question simply as a consequence of the constraints universally imposed by pan-human anatomy and physiology).

In this English example, we have seen one phenomenon which suggests that the lifecycles of rules and organisms differ in an important way, so that it is best not to make too much of that analogy. It appears, namely, that Old English palatalization went directly from being a phonetic/allophonic rule to being a morpholexical one--that it skipped one stage of its expected lifecycle. Thus, while organisms cannot skip stages of their lives (e.g.,
caterpillars never become butterflies directly, without first undergoing a pupal stage), sound-structural rules apparently can skip such stages of life—though probably only certain stages. Thus, as regards changes in sound-structural type, the lifecycle diagrammed above should be taken to imply more about their directionality, general order, and possible sequences than about a single prescribed set of steps.

In any case, though, our general intuitions about the lifecycle of sound-structural rules, as well as the specific example of English palatalization, should suggest to us—I believe—that phonological theory needs some concept and device like an ERT in order to account for and explain such changes. First, there is obviously a need for a theory concerning the possible types of sound-structural rules, as a way to motivate the various stages in the evolution of processes. Second, obviously also required is a set of conditions to govern the transitions of rules between these stages (or states). And, since the origin of phonetic rules—the inventory of potentialallophonic alternations—is so clearly crucial to achieving the goal of predicting the range of possible sound variation in human language, it seems desirable to elevate this first "interstate" transition to a status that is part of a separate, third component of the lifecycle framework. And thus we have now more concretely derived the three aspects of the ERT that we arrived at, earlier, by rather abstract reasoning.

At this point, then, it is time to spell out in detail precisely what these three component parts are, how they function within the overall ERT, and what specific motivation can be given for them—based either on preexisting arguments or on evidence newly gathered here. Such matters, to repeat, form the topic of the entire second part of this work (= Chapters III-IX), which
is correspondingly divided into the three general sections that immediately follow.
FOOTNOTES FOR CHAPTER II

1 For example, Anderson 1979a has persuasively argued that "...[t]he central innovation of the theory of Chomsky and Halle (1968) over pre-generative discussions is undoubtedly the extent to which it attempted to make explicit the principles relating phonological to phonetic representation" (p. 2). "In ... the conception [of Chomsky and Halle 1968,] ... a phonological theory is first and foremost an explicit notational system of description specifying a) the formal character of phonological and phonetic representations...[,] b) the formal character of the individual components of the operation mapping one representation onto the other (the 'rules')...[,] and c) an effective procedure for applying the set of rules so as to effect the required mapping[-]...this involving both a definition of what it means to apply a rule to a representation and a specification of the ways in which the rules can interact" (p. 3).

"... [Now, of these three aspects, the first--t]he existence and association of two levels of sound structure[--]had generally been accepted at least since ... de Saussure and Baudouin de Courtenay. ..."The unique contribution of the standard theory of generative phonology, then, was not in the character of the phonological representations that it proposed..., or even in the extent to which the character of these representations was made explicit and a goal of scientific inquiry...[. R]ather[, it was] in the theory's concentration on making explicit the principles governing the association of phonological with phonetic representation[--these principles being] ... conceived as a system of rules or [an] algorithm for converting one [representation] into the other in a series of steps." "The theory required the individual rules to
be specified with a formal precision quite unprecedented in discussions of phonological structure (which had concentrated on the character of the representations themselves). Further, since the rules of such a description are in principle interdependent..., their potential interactions ha[d]... to be specified with comparable precision" (p. 3). (Cf. also Anderson 1985:passim.)

2 Thus, Kiparsky 1975 pointed out that "... the investigation of linguistic change [is more than] a kind of applied linguistics, a nice thing you can do with a theory of language once you've got it, or ... a source of 'external evidence'... which we can use for the testing of competing linguistic theories. ...[Unfortunately, a] historical explanation, as far as the current theory of linguistics goes, is equivalent to no explanation at all. ... The ... result is that the field as now constructed invites linguists to put things at all costs into the synchronic grammar so that it will be possible to talk about them officially there" (pp. 204-205). "...[But] historical explanations can be far from trivial. They ... involve assumptions about the structure of ... language and about the structure of change" (p. 206).

"The right move is ... to rethink the goals of linguistics in ... [such] a way as to make the theory explicitly accountable for change. That is, keeping the distinction between structure and change, give up that between two separate kinds of linguistics. ... Fortunately, ... this is the direction in which the field is moving.... Historical and synchronic considerations have become so closely interconnected that the division has in practice become hard to maintain. It is...[, however,] still necessary to make explicit the view ... [that] linguistics ... [is] a genetic science[, in order] to remove the disreputable aura that still adheres to historical notions" (p. 206).
"...[T]his point of view will have the beneficial effect of helping to resolve the perennial debates on abstractness and related topics. As linguists begin to see more clearly the respective domains of historical and synchronic explanation, the subjective motivation for abstract underlying representation of the type which has been contested in recent discussions is likely to lose ... force. It is precisely the requirement of making grammars into adequate bases for a theory of change which provides the strongest motivation on the one hand to retain that part of synchronic structure which is needed [in order] to account for structure-governed types of change ... and on the other hand to throw out the historically explicable residues of change that have ceased to play a role in the system" (pp. 207-208).

3 Of course, the transmission of language across time is actually a discontinuous process of grammar hypothecation, each time anew, by speakers responding to the linguistic output (and not directly the grammars) of others. Hence the issues raised by the apparent lifecycle of sound-structural rules can less metaphorically but more neutrally and accurately be said to revolve around two separate questions. First, there is the necessity of accounting for the massive formal and substantive/functional similarities that tend to exist between and among rules of sound structure in the grammars of persons speaking the same language at different times--not to mention the same time--in history. Second, though, we must also explain why, in cross-generational comparisons of what intuitively seem to be different versions of the same sound-structural rule (or at least--more or less--the same alternation), later versions tend to be less phonetic and/or phonological and more morphological and/or lexical.
It is well known in generative phonology that the same rule can at some times have allophonic effects while at other times having phonological effects (in the sense of neutralizing a phonemic distinction; effects of this latter kind are often called "morphophonemic", since in American structuralist terms they involve the distribution of phonemes in complementary morphological environments). Halle's 1957, 1959 famous discussion of Russian voicing assimilation, for instance, crucially involves this property. For the purposes of a sound-structural rule typology, any such hermaphroditic allophonic/phonological process can be treated as a phonological rule, rather than as a hybrid or as two rules (and least of all as a solely allophonic rule). (More will be said about this issue below, when the various rule types are defined in full.)

In fact, quite the opposite is the case. When speakers no longer recognize the connection between members of a pair (or among a larger set) of alternants, it is as if the individual pieces of such a decomposed alternation provide the raw material that can give rise to new phonetic processes. It is perhaps worth pointing out that such a perspective denies the possibility of reincarnation, as it were, within and across the sound-structural lifecycle. That is, even though the lifecycle in question can be diagrammed (as above) in the form of a circle, it is not as if "the same essential alternation" can go around and around the lifecycle in different guises. Rather, the repetition of a sound-structural process (and of a particular course for its evolution) at more than one period in the history of a language or languages is to be viewed as different lives that merely happen to resem-
ble one another (due to similarities in the physical and psychological media that engendered them).
APPENDIX II
On the Adequacy of Current Phonological Theories
as Bases for an Evolutionary Typology of Sound-Structural
Rules

II.1. Theories That Do Not Incorporate an Adequate Typology of Phonetic,
Phonological, Morphological, and Lexical Rules.

It would be both impossible and misguided to attempt here a survey of
all current phonological frameworks. I will therefore take as a representa-
tive sample only those mentioned in Dinnsen (ed.) 1979 and van der Hulst
and Smith (eds.) 1982a and 1982b, supplemented by a few others.

Of the various approaches represented in this sample, two are focused
primarily on developing a formalism for handling suprasegmental phenomen.
One such theory is "Autosegmental Phonology"; cf., e.g., Goldsmith
1976a/1976b/1979a, Clements and Ford 1979, and references there, as
well as McCarthy 1982b, van der Hulst and Smith 1982, Halle and Clem-
ents 1983, and their references. The other theory is "Metrical Phonology";
and Prince 1977, Vergnaud, Halle et al. 1978-MS/1979-MS, the articles in
Linguistic Inquiry 10.3 (1979) and 11.3 (1980), Hayes 1980/1981, Halle
and Vergnaud 1981, and references there, as well as the overviews in Mc-
Carthy 1982b, van der Hulst and Smith 1982, and Halle and Clements
1983, plus the references in those works. These two approaches can be
brought together under the rubric "Multilinear Phonology" (also sometimes
"Plurilinear Phonology"), although the less apposite "Non-Linear Phonolo-
gy" is probably more common.
The suprasegmental prosodic phenomena that the two theories in question cover with novel insightfulness and elegance include tone, pitch accent, nasalization, vowel harmony, stress, intonation, and syllable-structural processes. Since these frameworks are undergoing constant and rapid development, it is difficult to present an up-to-date characterization of either. (Cf., though, the collections of some of the most recent work in van der Hulst and Smith (eds.) 1982a and 1982b, but also Harris 1983, Prince 1983, Hayes 1984, Selkirk 1984, and Phonology Yearbook 1 (1985), 2 (1985), and 3 (1986).) However, it does appear that both Autosegmental Phonology and Metrical Phonology recognize several types of rules of sound structure, as well as different types of representations.

In so doing, these theories thus seem to entail a rule typology of sorts. On the one hand, there are the segmental, "old-fashioned" rules of Standard Generative Phonology (SGP) or its continued general type—the "GV" or 'Garden Variety' rules" of Anderson 1982b. On the other hand, there are (autosegmental and metrical) suprasegmental rules concerning the association of segments or their features with "autosegments", "prosodic templates, "stress trees", "metrical grids", etc. However, this rule typology does not concern the rule types whose evolution we are interested in here—namely, phonetic, phonological, morphological, and lexical rules. Nor does it as yet seek to explain change of rule type. We must therefore conclude that Multilinear Phonology alone, despite its many merits, is not the proper theory for illuminating the lifecycle of sound-structural rules. Rather, I will view it here as a source of insights to be incorporated into the theory that does lend itself to our task—current generative phonology (GP).

Similarly, the theoretical approaches of "Atomic Phonology" (cf., e.g.,
Dinnsen 1979 and references there), "Functionally Constrained Phonology" (cf., e.g., Houlihan and Iverson 1979 and their references) and "Equational Grammar' Phonology" (cf., e.g., Sanders 1979 and his references) all also involve a kind of rule typology: between, respectively, "atomic" vs. "non-atomic" rules; "neutralizing" vs. "allophonic" (and "marked output" vs. "un-marked output") rules, and "equivalence" vs. non-"equivalence" rules, among others. However, although Houlihan and Iverson explicitly focus on diachronic change in rule type, while Dinnsen and Sanders also address historical issues, none of these theories contains an articulated theory of the type properties of phonetic, phonological, morphological and/or lexical processes. These three theories thus must also be dropped from consideration as potential bases of our framework for studying the evolution of sound-structural rules.

Matters are only slightly different as regards "Upside-Down' Phonology" (UDP) (cf., e.g., Leben and Robinson 1975/1977, Leben 1979, and works cited in the latter). Although this theory evolved in response to diachronic issues at least as much as to synchronic ones, and although it employs a useful device/mechanism whereby sound-structural redundancy rules "parse" representations, UDP likewise lacks a sufficiently rich and strict differentiation of the properties of phonetic, phonological, morphological, and lexical rules to serve as a foundation for the lifecycle concept. This is actually not surprising. As I have argued at length elsewhere (cf. Janda 1977/1980), when the mechanical problems of UDP are patched up, the theory becomes essentially a notational variant of SGP—which itself suffers from too homogeneous a set of rules, as discussed here in the main text. (We are not considering SGP itself at this juncture because it is not a current ap-
proach to phonology.)

Thus, for our purposes, all of the phonological frameworks considered so far have in common the deficiency that their rule typologies are improper bases for studying the rule evolution which we are interested in understanding. They further share the property that we will have relatively little or no occasion to make use of them (even their subparts) when we adopt another theoretical approach for the sound-structural lifecycle. There is another theory, however, which we will want to adopt much of, in our final framework, although it lacks adequate coverage for rule types of "higher orders" (= phonological, morphological, and lexical rules, as opposed to phonetic ones). In fact, after making a number of changes in it, we will in a sense want to incorporate the theory of "Natural Phonology" (NP) (see especially Donegan and Stampe 1979) almost wholesale into the final project. The reason for this is that, as opposed to all of the previously mentioned approaches, NP extensively covers issues of the origin of phonological rules in phonetically "natural processes". And precisely this, I have said, is one of the three crucial ingredients of a successful evolutionary rule typology (ERT). Thus, let us reserve discussion of NP for when we incorporate it into the final model (cf. the main text).


There thus remain only three phonological theories to consider. These three all come much closer to providing an adequate potential foundation for the rule lifecycle; in fact, all three theories explicitly aspire to do so. This is especially true of "Natural Generative Phonology" (NGP) (cf., e.g., Venne-
mann 1971, 1974, [Bybee] Hooper 1973/1974, 1976, 1979, and Klausenburger 1979, plus their references). But it also holds for Dressler's "Polycentristic" Theory of Phonology and Morphology (cf., e.g., Dressler 1985a, 1985b, 1985c, and references there). And the emphasis on rule evolution in Linnell's "Functionally-Based Typology of Phonological Rules"—although demonstrably less prominent than in NGP or Dressler's theory—is still a discernible component of that framework (cf., e.g., Linell 1974, 1979a, 1979b, and the works referenced there). The commitment of advocates of these three approaches (especially those of NGP) to elaborating a theory of both synchronic rule types and diachronic changes in type status thus constitutes one of their most telling and, from the viewpoint of the present enterprise, most commendable features. It is therefore much to be hoped that, whatever course these research programs may take in the future, they will—regardless of any weaknesses or flaws which they may have—continue their present concentration on the typological evolution of rules.

II'3. Reasons Not to Select One of the Non-Standard Theories' Rule Typology.

However, none of these last three frameworks has been chosen for the present study of the lifecycle of sound-structural rules—which decision carries with it an obligation to justify such a choice. My rationale for rejecting NGP, Dressler's Polycentristic Theory of Phonology and Morphology, and Linell's Functionally Based Typology of Phonological Rules in favor of one version of current generative phonology (= essentially a radically revised and extended form of SGP) centers primarily on the unwarrantedly more aprioristic basis of the sound-structural rule typologies in the former as com-
pared with the latter. It is true that the rejected approaches are able to ad-
duce historical evidence in favor of some of their general synchronic rule
types (e.g., the "P-rules" ("phonetically-motivated processes"), "MP-rules"
(= morphophonemic rules), and "via rules" of NGP). But, despite these the-
tories' frequently expressed adherence to the use of "external" evidence in
establishing the psychological reality of grammatical constructs, the basis
for their more specific rule types--and especially for their assignment of par-
ticular rules to such categories--is often unmotivated and hence essentially
taxonomic. Relatively little "internal"--much less external--evidence, that is,
is presented in support of such subtypes and of the assignments to them of
specific processes, as opposed to the situation in the theory to be adopted
here (which is presented in the main text).

This conclusion rests on a fundamental assumption which I am making
about typologies: that something more than definitions must be connected
with their categories if they are to be either useful or interesting. Labels can
be invented for virtually anything--hence also for virtually any kinds of pho-
nological rules: ones mentioning syllable structure, or high vowels, or the
feature [coronal], etc. Unless rule types and subtypes correlate with some
other aspect of the organization of grammars, however, there is scarcely
any basis to prefer any one rule typology over another.

As Sommerstein 1977:211 puts it: "...[l]n order for ... [a] distinction to be
worth making, it must be shown that ... [the members of a certain category
of] rules have something in common beyond the defining characteristics that
make them count as ... [such] rules. Otherwise, the class of ... [such] rules is
not much more interesting than the class of rules first postulated on Tues-
days." In saying this, I do not mean to suggest that, e.g., all assignments of
rules to types in current generative phonology can be externally or internal-
ly motivated. But I do claim that the types and assignments in the latter
framework are more motivated than in any other existing theory, and that
suffices to decide the issue. (The crucial evidence in support of this claim is
given in the main text, as part of the explication of the full sound-structural
rule typology.)

There are, of course, similar issues to be discussed regarding apriorism
in general as found in the various other theories. For example, on the one
hand, the anti-abstractness and anti-extrinsic-ordering tenets of NGP pre-
suppose that we already know the answers to some of the most interesting
questions about the psychologically real phonologies in speakers' heads.
On the other hand, though, the reason why we do phonology at all is presum-
ably that we do not yet know these answers. Instead, we hypothesize
about and test various possible answers in order to arrive at ever more de-
finitive conclusions about sound structure, rather than just looking for a pre-
conceived and predetermined result in whatever data we may encounter.
Thus, I take it that abstractness and rule ordering, for instance, are still open
questions. Most importantly, these are issues where we can presume there
to exist relevant evidence which can be found and utilized in order to arrive
at determinate answers. As Anderson 1979b:138-139/1980b:119 ob-
serves, "the value of ... [any theoretical claim or] observation for our know-
ledge of language ... turns on the fact that it is a logically contingent propo-
sition. Simply asserted by fiat, it becomes totally uninteresting, a limitation
on what sort of world we are willing to countenance. Taken otherwise, how-
ever, it can be falsified by ... [a] demonstration that in at least one language
there is a well-supported instance of a contrary ... [case]."
And so I also take the fact that certain versions of current GP make fewer assertions by fiat to be a further reason for preferring that general theory over NGP and other rival approaches. I am sure that proponents of these rejected theories (and of ones not mentioned here) would disagree strenuously with the present decision to adopt the framework of current GP—particularly with at least some of the reasons just given for doing so. But I do not claim to have done more, in the last few paragraphs, than advance an opinion about the deficiencies of other phonological approaches and about the virtues of modern mainstream generativism. Consequently, the best argument for the latter theory will be its value in establishing an evolutionary rule typology (ERT), and so the reader is hereby referred to its employment for that purpose in the main text, where (s)he can be the judge of the result. In the body of this work, then, I make almost no further comparisons of general phonological theories, but at most occasionally compare particular analyses of specific data which may well stem from different frameworks. As a result of such particularized comparisons, aspects of such analyses and hence parts of the approaches which engender them may thus end up incorporated into a version of current GP.

II’.4. The Overall Phonological Theory to be Adopted Here: Current Generative Phonology (GP).

By "current GP", I mean the theory of phonology that has resulted from the many modifications of the SPE-framework (= SGP) which have been proposed, refined, and/or integrated in such representative works as Bach 1968, Kiparsky 1968b/1968c/1973a, Anderson 1969b/1971, Howard 1972a/1972b/1972c, Selkirk 1972/1980/1982a, Kiparsky 1973c/1973d/

Apart from "autosegmentalization" and "metricalization" (as well as "lexicalization"), the individual modifications in question have often been fairly limited. Still, added together, they have changed SGP quite substantially: conditions on abstractness; the possibility of local rather than linear ordering and of directionally iterative rules; the "Elsewhere" Condition; admission of limited globality; restrictions on exchange rules; the introduction of mirror image rules; constraints on the interpretation of variables; an early widespread abandonment of and then a recent partial return to the theory of markedness; allowance for the intermixing of morphological and phonological rules, and--most importantly, for our present purposes--the recognition of significantly different rule types. What makes the resultant theory still count as a version of SGP--albeit a radically revised and extended one--is its combination of the spirit of the general SPE program (e.g., formal rigor and reflection of generality in rules, though without so much reliance on the "evaluation metric" as before) with many of SPE's specific principles (e.g., allowance of extrinsic ordering and of surface/underlying disparities).

In regard to the question of codification or synthesis: significant consensus exists on many points, but there is no single work which embodies all and only these, serving as a kind of "SPE II". Several books and/or series of articles probably once came close to doing this, but, by now, current generative phonology actually exists only insofar as one creates it, by picking
and choosing from among the various suggestions made since 1968. There certainly is no monolithic theory to be found here. Thus, as I adumbrate, both here and elsewhere in this work, some of the characteristics of what I take the theory in question to be, the reader should be warned that this is a personal view not necessarily shared to its full extent by anyone else. Such is particularly true of the important role accorded phonetic substance in the theory. In this and many other matters, though, I have been heavily influenced by the work and view of S. Anderson.

In particular, it is Anderson who, in the last decade or so, has been the foremost proponent of both an evolutionary rule typology (ERT) and the synchronic phonetic/phonological/morphological/lexical rule typology which forms its core. The latter is discussed in Anderson and Browne 1973:462-464 and Anderson 1974a, 1974c:xiv-xv, 9, 95-96, 122-123, 296, 1975, and 1979a:6, 11-13, 29-30—but also, along similar lines, in Sommerstein 1975, 1977:204-205, 205-211 et passim. (In fact, to the best of my knowledge, this aspect of sound structure has been studied within generative phonology proper only by the authors mentioned above and in these works just listed.) And the notion of an evolutionary typology of the sort in question here seems to have been introduced into modern phonology—with a full appreciation of such nineteenth-century precursors as Baudouin—only in programmatic statements by Anderson 1979a:29-30, de Chene and Anderson 1979:531, and Anderson 1979b:141/1980b:121, 1980c/1981a (especially 1980c:56-58/1981a: 512-514), and 1985. (Again, I believe this list to be exhaustive.)

Since I take current generative phonology to include—in addition to the innovations mentioned above—both a rule typology of the sort under consid-
eration and an evolutionary interpretation of it, the theory in a sense ends up largely synonymous with the evolutionary rule typology (ERT) itself. Therefore, the most appropriate place to supply further details of current generative phonological theory is in an exposition of the full rule typology—such as that given below in Section B of Part Two of the main text. Thus, in order simultaneously to provide a tie-in to that exposition, to cement the arguments for the lifecycle of sound-structural rules given above in Chapter II of the main text, and to acknowledge the pioneering work of Anderson in laying the foundations for the whole enterprise, it seems appropriate to close this Appendix II by presenting that linguist's five generally available formulations of the case for the plausibility and promise of an evolutionary rule typology (ERT) as the way to characterize most fully the notion "possible sound alternation of a human language".

(1) Anderson 1979a:29-30: "...[P]honological theory must ... recognize a systematic ... distinction ... among (sub-phonemic or) phonetic rules, phonological rules, morphological rules, and quasi-systematic relations among forms within the lexicon. Such a distinction ... corresponds closely to the ideas of Baudouin de Courtenay (1895[/1972]), who gives a similar classification of processes.

"... Baudouin['s] ... discussion, in fact, ... points up ... probably the most important use for such a classification of process types, when he treats the conditions under which phonetic rules become phonologized... [and] phonological rules become opaque and subsequently morphologized or lexicalized. Given a) a substantive typology of phonetically-motivated rule types, each narrowly and specifically constrained, and b) an account of the
conditions under which rules classified along another dimension (that of phonetic, phonological, morphological, etc.) can change their status along that dimension, we might well come quite close to a theory of grammar that is as explanatory as is intrinsically possible, in terms of our present notion of the nature of language."

(2) de Chene and Anderson 1979:531: "...[T]he range of possible sound patterns in natural languages can be approached only through understanding phonetically explicable conditions on the phonetic processes which are the origin of phonological rules (or at least the great majority of them) as they interact with the distinct conditions which apply to the evolution of such rules and to the internal structure of grammars. These latter conditions, of course, include the paths by which rules evolve in type: originating as phonetic or 'sub-phonemic' processes, they become phonologized--and may subsequently be altered, distorted, telescoped, inverted, etc. With the development of 'opacity' (in the sense made familiar through recent work in phonology), they may be reanalyzed as morphologically-conditioned variations, and eventually be relegated to the status of unproductive, merely lexical, correspondences among forms. Such an evolution was the main theme of Baudouin de Courtenay's program; and it is time to take it up again...".

(3) Anderson 1979b:141/1980b:120-121: "...[A]n understanding of the role of substance in phonology can only come from an understanding of the science of that substance[... to wit, phonetics. ...[N]ot all of the results of phonetic research are equally applicable[...[, though:] the most central sort
of phonetic research is undoubtedly that which aims at a notion of phonetic motivation and explanation. ... The most promising sort of synthesis seems ... to be found in the works of Baudouin de Courtenay, the 50th anniversary of whose death ... [was] mark[ed in 1979] .... Baudouin's inspired integration of the explanatory role of traditional phonetics (in accounting for the entrance of low-level processes into the system) with that of the study of the internal structure of grammars (in treating the relations, both evolutionary and synchronic, among the various sorts of rules) deserves serious reconsideration ...".

(4) Anderson 1980c:56-58/1981a:512-514: "...[It] is instructive because it is entirely typical... [that, w]hen we study a given rule's evolution over time, we find it to be characteristic of sound changes that they very often have the effect of separating a rule from its original phonetic motivation. ...[For example, w]hile there is little reason to doubt that Icelandic once had a rule of Velar Fronting which was amenable to external phonetic explanation (at least in outline), subsequent changes have resulted in a restructured state of affairs in which this is no longer true. In fact, if we were to attempt to impose phonetic naturalness as a defining condition on the class of objects we study in phonology, we would not be left with very much.

"There is certainly no doubt that a theory of possible (or plausible) phonological rules should reflect in some way the phonetic content of alternations and processes. This is because far too many rules encountered in far too many languages are sufficiently close to phonetic 'coherence' for us to believe that this is simply due to chance. On the other hand, languages do, with somewhat depressing regularity, contain unnatural rules as well, rules
whose phonetic motivation is not at all apparent synchronically, if in fact they have one. Indeed, as observed in a number of articles by various scholars (notably Bach and Harms ...1972...), apparently natural rules show a disconcerting tendency to be replaced by 'crazy' rules, as in the Icelandic Velar Fronting rule ... mentioned above. Other particularly persuasive cases of the evolution of once-natural processes into phonetically arbitrary ones have been presented in recent articles by Hellberg (1978...[,] 1980).

"The mechanisms by which such change in the phonetically motivated character of a rule takes place are those that are proper to the study of the internal development of grammars: changes in linguistic competence, motivated by properties of the system of language rather than by the necessities of performance, and showing no particular tendency to be constrained by the latter. These are the types of restructuring which various scholars have called 'rule inversion', telescoping', 'generalization', and the like, and their principles are ones which are appropriately studied in terms of precise formal statements of the content of grammars, not in terms of the exigencies of articulation, audition, memory, etc. We must ask how the specifically linguistic nature of the cognitive domain involved can be studied in a way that preserves the indisputable influence that extralinguistic factors have in shaping the nature of Language.

"An appropriate path to the resolution of this paradox is suggested (in outline) in the work of Baudouin de Courtenay.... Baudouin de Courtenay ...1895[/1972]... is a particularly important survey of his views concerning the nature, source, and evolution of phonological alternations and the principles that govern them. It would obviously be anachronistic to attribute to Baudouin a concern with some of the issues concerning phonologization,
opacity, morphologization, etc., discussed below; indeed, there is no reason to believe that he construed the alternations he discussed in terms of a notion of 'rule' directly comparable with that current today. However, his views prefigure to a remarkable extent much recent discussion of these topics. According to Baudouin[1, "one of the pioneers of modern phonology"], the role of phonetic factors in language is due to the fact that they condition a vast range of low-level, more or less mechanically determined variation in the speech signal--what he called anthropophonic effects in language. These generally operate outside of our recognition and, more importantly, without being determined by the grammar of a particular language. We might attribute the mechanical effect of vowel lengthening before voiced obstruents which is observed in most languages to this domain, for example, or the rise in pitch following voiceless obstruents and the corresponding lowering following voiced ones.

"Of course, such low-level, mechanically determined variation in the speech signal is not completely unrelated to the specific, grammatically determined properties of a given language. A particular language may indeed take up some such property and employ it linguistically (generally increasing the magnitude of the effect in the process). This may happen in several ways: for instance, as we have noted, some languages apparently make use of a potentially mechanical aspect of variability to establish or reinforce a contrast, or to provide a cue for some linguistically significant difference between forms. When English exaggerates the degree of necessary vowel lengthening, we can see this as a linguistically determined variation on the phonetically given possibility--perhaps employed to reinforce the language's voicing contrast by providing an alternate auditory cue, but in any
event incorporated into the system of the language rather than being any longer simply mechanical. Similarly, when a language develops tonal contrasts out of the originally mechanical pitch variation accompanying a (possibly lost) voicing distinction in obstruents, the same conversion of mechanically conditioned variation into linguistic significance can be seen.

"This evolution of mechanical, 'anthropophonic' variation into linguistically determined 'psychophonetic' variation is what has been called (e.g. by Hyman ...1976... in a valuable study of the role of this process in the development of tonal contrasts) the phonologization of phonetic variation. When a language comes to treat some articulatory, auditory or other property of speech as being systematically determined--possibly the basis of a contrast, but possibly just a linguistically controlled aspect of pronunciation in the particular language or dialect--we consider ... the property in question ... [to have] been phonologized. Phonologization is most noticeable in the form of conditioned exaggeration of a mechanical effect, but we can recognize the same principle when a general effect is suppressed: in Saudi Arabic, for example, when mechanical vowel lengthening is apparently prevented under linguistic control (possibly related to the fact that length is contrastive in Arabic, although Lehiste ...1970... shows that mechanical lengthening may occur in the presence of a length contrast), or in Yoruba when the F0 perturbation caused by prevocalic consonants is significantly less than in a language like English.

"The notion of phonologization, then, serves to resolve (or perhaps, rather, to recognize) the paradoxical role of extralinguistic factors in the system of language. On the one hand, as long as some property has not been brought under the control of the grammar of a language, it is determined by
nonlinguistic constraints or tendencies. On the other hand, the effects of these latter factors may be explicitly recognized, systematized, and taken over by the grammar by being phonologized. Since phonologized effects can overrule merely mechanical tendencies, we can see that everything that is natural need not be completely pervasive; nonetheless, if the phonologization of 'anthropophonic' variation is the raw material giving rise to phonological rules in the grammars of particular languages (as suggested in Baudouin's program), we can see why rules tend to resemble phonetically natural processes.

"When a rule is phonologized, however, it is important to recognize that its status has changed: even though it may have originated in the exigencies of articulatory dynamics, for example, when it is incorporated under the control of the cognitive system which is at the heart of Language, these factors no longer limit or prescribe its content. The motivations for subsequent evolution of such a process are quite different, and internal to the system of language as discussed above. These, too, were largely outlined by Baudouin: a phonetic difference, once mechanical but now linguistically determined, may become the basis of a contrast; the rules distributing some such property in linguistic forms may become opaque through the accretion of other, subsequent rules, and may change in content; rules whose phonological conditions have become sufficiently opaque may be reanalyzed as conditioned by morphological factors (that is, they may be 'morphologized'); and even morphologically conditioned alternations may eventually, through similar developments, be reduced to the status of mere lexical correspondences....

"The essential step on this path for our purposes, however, is the first
one: when a process is phonologized, it becomes in an important sense phonetically arbitrary, even though it may continue to reflect a phonetically natural content. Phonetic explanation thus serves as a sort of constraint on the entry of processes into the system, since (at least many, if not perhaps all) rules originate in the raw material of phonetically natural variation.

Once phonologized, their essential character is radically altered. When we recognize that much of phonology (and phonological change) is phonological—not phonetic—and thus rooted in the system of language, we can reach a better understanding of the processes involved and (perhaps paradoxically) of the role of phonetic motivation in Language.

"... [Thus, m]ost work in phonological theory that has sought to provide explanatory accounts of observed phenomena (rather than just descriptions) can be divided into two categories: attempts to find the basis of the facts in extralinguistic domains of phonetic substance; and studies of the internal properties of particular formal systems of description. On the program sketched thus far, however, neither of these approaches can be expected to be completely successful by itself. Only by recognizing both the external phonetic basis of much linguistic variation and the internal linguistic principles that govern its systematization in a grammar can we hope to understand why things are as we find them."

(5) Anderson 1985:345-346: "As observed already by Baudouin (see chapter 3...[, "The Kazan[] School: Baudouin de Courtenay and Kruszewski", pp. 56-82], even those processes with the most evident phonetic motivation tend to acquire arbitrary aspects once they become part of the grammar of a particular language ('phonologized'). ...[Based on a] number of
examples of this sort...[.] we can note that the appearance of arbitrary, 'learned' aspects in rules affects even apparently low-level phonetic processes such as vowel lengthening before voiced obstruents in English (whose degree is not phonetically explicable, but must be regarded as an arbitrary fact about English) or velar fronting before front vowels in Icelandic (which applies before some vowels that are no longer phonetically front, though they used to be, and not before others that are front but that come historically from back vowels). ... We should ... [thus] recognize the modularity of language: the fact that it represents the intersection of a number of distinguishable domains, each subject to its own principles.

"In these terms, it can be suggested, a fundamentally modular theory with a serious claim to genuine explanatory capacity already exists in posse in the views of Baudouin and Kruszewski sketched in chapter 3. On that picture, the phonetic capacities of speakers function to determine the 'raw material' for sound change and other substitutions, which serve as the source of synchronic regularities in natural language systems. The impact of such 'natural processes' on phonological systems, however, is the result both of their substantive content and of the interaction of this with the processes of phonologization and historical change--for they are no longer phonetically determined in their essence, once incorporated into the grammar of a language. Many (if not most) of the details of such a theory remain to be developed, but at least in outline it appears to present the possibility of achieving an understanding of the scope of 'phonetic explanation' in phonology, without abandoning the requirements of comprehensive and accurate description."

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The above quotations are admittedly not brief, but presenting them in full here serves more than one worthwhile purpose. First of all, they indicate both the priority and the nature of Anderson's nearly unique research on a sound-structural rule typology within GP--especially its evolutionary aspect. Second, they thereby reveal just how limited and programmatic all previous generative investigations of the/an ERT have been--a fact which I am sure Anderson himself would be the first to acknowledge. And, third and finally, they should make it easier for readers of the present work to determine, on the one hand, what in this dissertation is original and what derivative and, on the other hand, what represents an advance or a retreat vis-à-vis earlier research.
PART TWO
The Specific Nature of and Motivation for an Evolutionary
Typology of Sound-Structural Rules
[= Chapters III-IX]

SECTION A
[= Chapter III]
CHAPTER III

The Source Component of an Evolutionary Rule Typology: Phonetic Origins of Sound-Structural Alternations and Rules

III.0.

This chapter surveys the specific work which either has already been done or else still remains to be done concerning the what and why of how sound-structural rules apparently always have their ultimate origins in phonetics. The chapter first reports that the literature is unanimous in limiting its search for the sources of sound patterns in language to speech anatomy and physiology (including especially articulation), to acoustics, and to audition. Next, two approaches to phonology are discussed which have carried out the most detailed investigations into phonetic processes and how they arise—namely, the "Natural Phonology" of Stampe and his collaborators and what can be called the "[Phonetic-]Experimental Phonology" of J. Ohala and his associates.

Although the aspirations of these theories to be complete accounts of phonology must be rejected, their partially complementary but also partially overlapping phonetic results can be adopted into an evolutionary rule typology almost wholesale, especially the inventories that they have compiled of phonetically natural processes and of the mechanisms by which these come to be linguisticized. Finally, a fairly negative evaluation is presented regarding how much progress has already been made toward elaborating an explanatory source component for an evolutionary rule typology of sound-structural rules—vis-à-vis how much progress still needs to be made before this aspect of the typology can be deemed truly to yield predictions
and therefore also constraints concerning possible alternations in the sound-structures of human languages.

III.1. The Primordiality of Phonetics.

Chapter II above--in the course of providing general motivation for an evolutionary rule typology (ERT) based on considerations of phonetic substance relating to patterns, similarities, and change of type among sound-structural rules--stressed the importance and literal primariness of the lifecycle's source aspect. And that is why, in beginning to treat the specifics of an ERT, it makes sense to turn first to the issue of the phonetic origins associated with rules of sound structure.

In this connection, it is perhaps advisable to mention at the outset that there is no logical necessity for sound-structural alternations to begin as phonetic rules--as low-level articulatory, acoustic, or auditory phenomena. One can, that is, quite easily imagine a scenario where sound patterns come into being "overnight" as, say, morphological alternations or even isolated lexical correspondences. However, I do not know of even a single work in the linguistic literature where such a possibility is claimed to have been empirically instantiated. Rather, when they express themselves about such matters at all, phonologists seem uniformly to assume that sound alternations ultimately originate in phonetics alone.

Thus, for example, Kenstowicz and Kisseberth 1977:63 state flatly that "...[p]honological alternations generally have their ultimate source (historically speaking) in sounds being affected by the phonological context in which they occur. In other words, synchronic phonological alternations are largely the consequence of sound changes that have occurred in the his-
tory of ... [a] language, and these sound changes are generally environmentally conditioned, altering a given sound only in a specific environment. Furthermore, the sound changes in question are generally phonetically motivated; that is, not only does the change take place in a specific phonological context, but there is also a phonetic explanation for why the change in question occurs in the context that it does.”

The hedging term "generally" in the first line of the above quotation is probably meant to cover cases of inexplicable sound changes--ones where no phonetic explanation is apparent. Such instances are not as rare as one might hope, but the explanations proposed for them are still almost invariably formulated in terms of ultimate phonetic origins. Thus, either the past phonetic cause of an alternation is sometimes assumed to be as yet unknown, but nevertheless real and so amenable to future research and discovery, or else the puzzling sound change is attributed to social factors—to the misunderstanding of someone's originally phonetic alternation by somebody else.

Thus, it would be of the utmost importance for both diachronic and synchronic phonology if there existed documented cases in which phonetic variation ultimately arose non-phonetically. However, to the best of my knowledge, no such examples are attested, and so I will henceforth assume that they are, indeed, not a natural-language phenomenon. The ERT could, of course, be modified and complicated in order to accommodate non-phonetic origins of phonetic rules, but their absence fortunately allows greater possibilities for constraining the range of sound patterns in natural language, in ways that I take to be obvious. People just don't seem to sit down and try to introduce new alternations into sound structure, and so one
need not plumb the depths of general human creativity (or perversity) in seeking to limit the range of phenomena covered by the ERT.

The starting point for all sound-structural alternations, then, is apparently phonetics—to repeat: not just articulation, but also acoustics and audition. Hence, the first component of an ERT must involve the investigation of low-level phonetic phenomena. I hardly need to state that our knowledge in this area is not absolute, and from this it follows that an ERT, as a whole, cannot at present predict the full range of sound patterns in language. However, I did not earlier claim that an ERT can now achieve such predictions, but only that it is in principle capable of achieving the goal in question. An ERT embodies a research program well worth pursuing, then, and its phonetic aspect should thus incorporate those findings of phonetic research which are most promising as regards explaining the origins of sound-structural alternations. Here, two lines of research are most prominent.

III.2. Adapting and Adopting Approaches to Phonetic Rule Origins.

III.2.1. Stampean Natural Phonology (NP).

In this regard, let us first consider—somewhat surprisingly—a phonological theory: the "Natural Phonology" (NP) of David Stampe and his collaborators (especially P. Donegan) and adherents. This approach has proven extremely productive, as shown by its already large literature (cf., e.g., the references in Stampe 1969/1979a, 1972/1973/1979b, 1984, and Donegan and Stampe 1979). NP is relevant to research on the phonetic sources of sound alternations precisely because it defines the essence of phonology as phonetically natural processes—"natural processes", for short. In fact,
NP basically excludes phonetically unnatural sound-structural alternations from the domain of pure phonology; at the very least, it deems them uninteresting. Such "learned rules" are all treated as essentially morpholexical, that is—even if they do not seem to refer to specific words or morphemes or to classes of these.

This rather atypical view of phonology follows from Stampe's claim that children's acquisition of sound patterns does not involve learning rules and how to apply them, but, rather, learning to block (= learning not to allow to apply) the natural processes that are innately given to people at birth along with their speech apparatus. To the extent that they are not blocked, natural processes apply in speech—but outside of grammar, as it were. If phonology really does consist mainly in natural processes being either blocked or allowed to apply, then there obviously results from this a cogent account of why sound-structural alternations so often have a discernible phonetic basis.

Stampe goes much further, however, and picks out certain speech situations as ones where natural processes will be most likely to apply: fast or casual speech, children's speech, speech errors, pronunciation of non-native words (whether in discourse, as a foreign accent, or in isolation, for loanwords), and the like. Given the attested influence of many of these factors on contemporary sound change (cf., e.g., Labov 1972a, 1972b) vs. the impossibility of determining them for old and especially ancient phonological change, Stampe also accepts the frequency of sound change patterns as a situational indicator of naturalness. All of these situational tests for naturalness are then matched up against the set of natural processes and the set of learned rules, and it is claimed that the distinction between the latter
two is thereby borne out: phonetically natural processes apply in what could be called "natural situations"; learned rules do not.

Further research in NP and other approaches has corroborated this finding to a significant extent, but a number of recent non-NP studies have shown that an absolute dichotomy between natural processes and learned rules cannot be maintained. Such studies demonstrate that phonetically natural processes can become somewhat or even quite "denaturalized"—in terms of their phonetic environments, inputs, and/or outputs—without thereby ceasing to apply in natural speech situations. And, conversely, the research in question shows that, in some languages, certain phonological rules which seem clearly to be natural processes do not apply in many natural situations. Such investigations have yielded two main findings. On the one hand, it probably is relatively rare for seemingly natural processes to have absolutely no learned component. On the other hand, seemingly unnatural, learned rules can still have a definite claim to psychological reality (as phonological regularities possessing general validity throughout an entire language), since they, too, can apply in natural, so-called "external evidence" situations.

This is, of course, a major point, and so it certainly deserves a careful and comprehensive discussion. Fortunately, however, at least two lengthy articles from the recent phonological literature are devoted almost entirely to exactly this issue—namely, Dinnsen 1980 and Anderson 1980c/1981a (but cf. also the responses by Darden 1985, Dressler 1985a, and Churma 1985). Therefore, besides referring the reader to those two works, I will present only a few brief examples in support of the contention that one must separate the three issues of phonetic naturalness vs. process-/rule- hood
(i.e.--for want of a better term--"phonological psychological reality") vs. application in natural situations, since they are all independent of one another both in principle and in practice.

Hellberg 1978, e.g., brings to bear on such matters the lowering of /ɛ:/ to [æ:] before retroflex sounds in Modern Standard Swedish. He shows that, while its structural description and change seem to meet all the usual phonetic naturalness criteria, the rule performing this change is "sensitiv[e]... to style of speech" but is "not sensitive to rate of speech," "not ... a genuine constraint on pronounceability", and "not an innate residue but ... actually learned during language acquisition" (p. 164). Similarly, Hellberg 1980 argues that Faroese "Velar Softening" and "Hiatus Insertion" have a schizophrenic status as regards phonetic naturalness. That is, they both seem to have stayed very close to their phonetic bases, but both of them also have morphological exceptions--and, in fact, neither of these rules seems to be productive any more.

Perhaps the most telling counterexamples to the absolute dichotomy between natural processes vs. learned rules postulated in NP are provided by cases where phonetically unnatural phonological rules apply in natural situations. Thus, Anderson 1980c/1981a points out that, on the one hand, English lengthening of vowels before voiced obstruents is--as shown by Chen 1970--so exaggerated (in comparison with vowel lengthening in other languages of the world) that it must be considered a learned rule of English. On the other hand, though, this rule still applies exceptionlessly in speech errors, English accents (in foreign languages), different styles of speech, etc. A second example of this phenomenon (briefly discussed by Janda 1979b) concerns Final Devoicing in Modern New (High) German
(N(H)G). This well-known process applies eminently naturally before pause and before words and syllables with initial voiceless segments, but it also applies phonetically unnaturally before words and syllables with initial voiced segments (cf., e.g., Lobgesang 'praise song, song of praise', with ...[p$g]). And this articulatorily unexpected subprocess is nevertheless found in natural situations. On the basis of such evidence, I will henceforth assume that phonetic naturalness cannot be imposed as an absolute requirement for bona fide phonological processes/rules.

Consequently, NP cannot be accepted as the currently most preferable overall phonological theory. But its focus on the relative naturalness of various phonological alternations/rules has yielded a large body of knowledge about the relative likelihood of different types of sound changes, and so NP has contributed significantly to clarifying just what sound substitutions are most phonetically natural. Stampe and his followers, that is, have elaborated detailed inventories of what phonetic changes are likely to occur in what sounds in what environments (cf. the references given above, for a large sample). In this way, NP has been responsible for new insights into the phonetic sources for "bleaching" and "coloring" of vowels, for phonological replacements in child language and second-language acquisition, etc. (although some scholars take the opposite view that NP's studies concerning, e.g., vowels have contributed only terminological insights).

Since such a greater understanding of the phonetic origins of sound-structural processes/rules is precisely what we want to include as part of the first, source aspect of the/an ERT, it is in this sense that we wish to incorporate NP almost wholesale into the lifecycle of sound-structural alternations. Of course, we must thereby first reject that theory's particular proc-
less/rule dichotomy and replace it with much more of a continuum, and we
do not necessarily wish to accept certain other stipulations of NP (e.g., the
ordering claim that all fortition processes precede all lenition processes).
Still, most of NP's findings regarding the catalog of phonetically natural
processes and their hierarchies of likely application can be taken over di-
rectly into the ERT almost wholesale--along with the emphasis laid, in NP,
on simple diligent searching for and critical evolution of any phonetic natur-
ality in any sound patterns of language. (Since no original contribution to
the ERT would be achieved via my discussing or even listing the specific set
of natural processes and their sources as recognized and organized by NP,
the reader is once again simply referred to the following NP works and their
references (as well as to the many issues of the Ohio State University
Working Papers in Linguistics prepared by Stampe and his students):
1979.)

III.2.2. The "[Phonetic-]Experimental Phonology" (PEP) of J. Ohala and His
Associates.

The second prominent approach to investigating the phonetic origins of
sound patterns which merits consideration here is that associated with the
works of J. Ohala and his students and/or colleagues. This line of research
shares with NP investigations the goal of providing phonetic explanations
for phonological and morpholexical patterns, but it differs from the latter in
that, while NP essentially proceeds from phonology "back" towards phonet-
ics, Ohala's program could be said to proceed "outward" from phonetics to-
wards phonology. This difference is due largely to the fact that Stampe and
his followers are primarily phonologists, while Ohala and his collaborators are primarily phoneticians—with all the grounding in and commitment to laboratory instruments and quantifiable experimentation which that title implies (cf. also the recent 1986 volume on *Experimental Phonology* edited by Ohala and Jaeger, as well as *Phonology Yearbook* 3 (1986)). For such reasons, I would therefore like to dub this latter investigative framework "[Phonetic-]Experimental Phonology" (PEP).

The fruitfulness of PEP for elucidating the phonetic sources of sound structural rules is perhaps a direct reflection of its distrust of non-phonetic phonological accounts for such processes. That is, PEP essentially operates on the assumption that alternations should be taken to be phonetically based unless there exists strong empirical evidence to the contrary. Thus, for example, Ohala 1974b:268 states that "phonetics ... [is "not"] the only relevant subdiscipline in phonology; obviously others such as psychology, history, etc. are also required. But ... phonetics should come first, particularly in such pursuits as explaining sound change, phonology acquisition by children and second[-]language learners, etc. ...[O]ne should first try all the phonetic explanations for the sound patterns observed and only if they don't work seek an explanation in terms of social, psychological, or historical ... [factors]. ...[T]here are rather strict constraints on what can be explained ... [in terms of] phonetic factors, whereas there are fewer constraints on historical or psychological explanations. It is too easy to invent non-phonetic explanations for phonological phenomena."

And, beyond this, PEP even investigates the alternation "potential" of phonetic factors independently of whether this is ever actually realized. Thus, there should be no doubts on anyone's part that PEP has a valuable
and necessary contribution to make to the source aspect of the ERT. In fact, the research program of PEP has already yielded numerous insights and findings of great relevance and importance for the study of rule origins in the ERT (cf., e.g., Ohala 1974a, 1974b, 1981, 1983, and references there). The usefulness and significance of PEP can be appreciated by considering a single concrete example.

Foley 1973:50 pondered the fact that, in the phonological history of Norwegian, $s$ became [š] before $l$ (hence, e.g., Oslo = ...[š]...) but not before $n$ (so that, e.g., (snakke 'to talk' = [sn̩]..., not *[sn̩]...). Foley reasoned (p. 51) as follows: "The conversion of $s$ to š cannot be attributed to phonetic influences[,] since $l$ and $n$ are both dentals, and in any case conversion of dental $s$ to palatal š looks more like dissimilation than assimilation...[, so] there is no phonetic explanation for ... [this sound change]. But there is a phonological explanation: $l$ is phonologically stronger than $n$, and $s$ is strengthened by proximity to $l$ but not by proximity to the relatively weaker $n$; the strengthened $s$ then manifests itself as š."

But Ohala 1974b:254--after noting that Foley's "notion of 'strength' is undefined"--goes on to point out (p. 256) that what is at issue is probably "an acoustically-caused change": "In all likelihood the [l] in the [sl] clusters become partially devoiced[,] yielding [s[l].... [l] is acoustically a fricative--in fact, it is very much like the fricative [f], as can be seen from the spectra of the fricatives [s], [ʃ], [l]...(provided by Ohala 1974b:255 (Figure 2)). This is true even though [ʃ] and [l] are very different in articulation. Thus, auditorily[,] [s[l]] could also appear to be [sʃl]. Probably there was then an ... assimilation of the [s] to the following fricative, yielding either [ʃl] or [ʃl]. Both forms are attested dialectally.... The reason [s] didn't become [ʃ] before [n]
is ... [that] if the same partial devoicing of the [n] had occurred in the [sn] clusters it would not yield a fricative sounding anything like [ʃ], and the fricative it would yield, [ŋ][ŋ] has extremely low intensity and wouldn't cause [s] to assimilate to it."

Such attention to acoustic-phonetic factors and fine articulatory-phonetic detail is the hallmark of work by Ohala and his collaborators, and its results are clearly a sine qua non for the ERT—if that framework is ever eventually to include an inventory of possible origins for sound patterns. PEP is especially responsible for emphasizing that it is not only the lower-level mechanisms of human pronunciation that are the sources for alternations, but also the higher-level mechanisms (not necessarily all linguistic) governing how listeners perceive the acoustic results of pronunciations by speakers.

It is, however, much the same with PEP as with NP: the evolution of phonetically natural alternations into less natural phonological, morphological, and lexical ones also receives scant attention on the former, more phonetic approach. In PEP, this stems from a refusal to accept any evidence for grammatical rules—of whatever kind—that is not of an experimental, direct-observational sort; other arguments are rejected as untestable and hence unscientific (as hinted at in the first quotation from Ohala given above). However, in laying out the sound-structural rule typology itself, we will later consider evidence from the internal organization of grammars which is nevertheless empirical. Hence we can and will reject the overly limiting structures of PEP, as well, and thus incorporate into the ERT only its focus on encompassing all of phonetics, not its emphasis on excluding most of the rest of sound structure and grammar. (Once again, rather than attempting to
provide a detailed summary of PEP's specific contributions to an understanding of how phonetic alternations arise, I will here simply refer the reader to Ohala 1974a, 1974b, 1981, 1983--plus Ohala and Jaeger (eds.) 1986 and *Phonology Yearbook* 3 (1986)--as well as the other writings cited in those works.)


By appropriating the phonetically relevant aspects of PEP and NP for the ERT, we can establish a strong foundation for the lifecycle concept and its associated research program--specifically, for the source component that "feeds" it. I must stress again that neither this chapter of the present work nor even the work as a whole claims to present a full-blown, definitive version of the ERT or any one of its three parts. Rather, a comprehensive, finely articulated inventory of possible phonetic origins for sound-structural rules undoubtedly lies far in the future. However, I do claim to have indicated here where significant results in this area have already been achieved, as well as the types of research that, if continued, are most likely both to ensure continued progress and to hasten it. (In addition, certain other proposals--mainly those of S. Anderson--concerning further, more detailed aspects of the ERT's source component are briefly discussed in Appendix III, which follows this third chapter.)

To summarize, then: the ultimate requirement for the source component of the ERT is a catalog of which articulatory-, acoustic-, or auditory-phonetic phenomena can give rise to alternation/rules, and which alterna-
tions/rules each such phenomenon can yield. I should reiterate that the inputs of the sources in question (as, e.g., presumably for the (Pre-)Old English palatalization rule mentioned in the last chapter) are not to be analyzed as rules of grammar--not even of Universal Grammar. (It is only in this sense that sound-structural rules originate from "nothing".) Rather, the inputs to such sources are to be taken as "hardware constraints (in the usage of Ohala 1974b) or as natural processes in the absolutely strictest sense--ones with no denaturalization at all. It is only the outputs of these sources--what they give rise to when they are exaggerated by the linguistic systems of speakers--that should be analyzed as grammatical rules: namely, as instances of the phonetic type of sound-structural alternation. In order to consider the type properties of phonetic rules in more detail, however, we must first place them within the overall framework of a general synchronic typology of sound-structural rules. And discussing the exact nature of and the motivation for this overall typology is precisely the subject matter of the next section of this second part of the present work (= B, Chapters IV-VIII).
APPENDIX III

Further Proposals (Mainly Following S. Anderson)
Concerning More Detailed Aspects of the Source Component
in an Evolutionary Rule Typology

III'.1. A Process Typology?.

Anderson, in various works over the last decade, has suggested that, just as an overall evolutionary rule typology (ERT) has internal structure, so does its initial subpart. That is, the inventory of origins for sound patterns—the list of which phonetic rules originate how—probably can and should itself be organized into a rule typology or process typology. There are, in fact, several historical antecedents for this suggestion. Anderson 1974c, for example, points out that some sort of process typology can be inferred from the various grammatical sketches in Boas (ed.) 1911 and 1922. And Anderson 1974c, 1979b/1980b, 1980c/1981a draws attention to the fact that proposals of this sort were also made—sometimes in great detail—by such phonetic/phonological pioneers as Sweet (e.g., 1874/18882, 1877, 1890/19063, 1899/1964, 1900:13-34, 1908), Sievers (e.g., 1876/19015), Passy (e.g., 1890), Rousselot (e.g., 1891, 1901-1908/1924-19252), Fouché (e.g., 1927), and Grammont (e.g., 1933/197119). Anderson 1979a further emphasizes the fact that even SPE:427-428 admitted the need for a "theory of 'plausible' phonological processes".

Anderson 1979a:29 envisions this phonetic-"substantive typology of phonological processes" as grouping together—while distinguishing (from all other processes)—"say, weakening processes such as degemination of obstruants, spirantization of stops, replacements of fricatives by h, etc. as a
unitary class, associating particular environments favoring such weaken-
ings with this class, and imposing substantive constraints on (precisely)
rules which fall into this category". And Anderson 1974c:295 further sug-
gests that "the various options [associated with a given process type] can ... be arranged into several hierarchically-organized dimensions."

There are several motivations for developing such a process typology
for phonetic-rule-creating mechanisms (or, better: for the thereby-created
phonetic rules) at the first stage of the lifecycle--a typology within a typology,
as it were. The main reason is that there very likely exist either (1) special
constraints on the application and/or ordering of different types of phonetic
rules or (2) differential conditions on the further evolution (into phonological,
morphological, and/or lexical rules) of such different phonetic rule types.
That is, it is to be expected that something follows from a phonetic rule's be-
ing (or having originated as) a certain type of process.

At present, however, little--if anything--is known about (1), so that, at
present, one can do little more than call upon others to investigate such
matters. And (2) properly concerns the third component of the ERT more
than the first--i.e., the set of conditions on possible transitions between rule
types. Thus, that latter issue is treated here as part of the discussion below
in Section C of Part Two of the main text (= Chapter IX), where the change-
of-type component of the lifecycle is treated as a whole.

III'.2. Phonetic Substance in the ERT as a Radical Departure from Standard
Generative Phonology (SGP).

In concluding this appendexical discussion of the first, origins aspect of
the ERT--which is arguably the central core of at least one version of current
generative phonology (GP)---it can be noted that considering the source component of the ERT in some detail allows one to see just how radical a revision and extension of SGP it represents. As concisely documented by Anderson 1979a, 1979b/1980b, "the primary nature of a phonological theory, as expressed in SPE, is the development of an explicit formal notation for phonological description. In combination with an evaluation function for grammars defined over this notation, this would result in a comprehensive axiomatization of the subject matter of phonology, in the sense that all problems connected with the discovery of a correct (or 'descriptively adequate') account of sound structure in a given language would thereby be reduced to the mechanical manipulation of expressions in a fully explicit notational system. Of course, SPE does not claim to have accomplished this goal, but it is nonetheless the program of the theory. ...[And t]he successes achieved within this framework were seen as confirmation of such an axiomatization" (1979b:133-134/1980b:115-116). "In particular the program of SPE leads, in the end, to the result that consideration of the substantive phonetic content of representations and rules has no natural role in the system of phonology" (p. 135/p. 117).

On the other hand, though---as argued here above in Chapter II of the main text---the SPE program of predicting the full range of possible sound patterns in human language can be carried out only by considering the possible diachronic sources for sound-structural alternations---in articulatory, auditory, and acoustic phonetics. And, along these lines, Anderson thus goes on to say that "... the role of phonetic content in phonology is such as to reveal a fundamental inadequacy in the full 'logicist' program for the field sketched in SPE" (1979b:135/1980b:117). "...[That is, although t]here is lit-
tle doubt that phonetic substance plays an important role in determining and justifying the choice of grammars, because it is basic to the nature of language...[t]his is, in an important sense, ... completely foreign to the essential thrust of the standard theory, which aims to construct a formal descriptive system in which any expression is at least potentially a rule of natural language" (1979a:4).

"[A] comprehensive notation for the expression and comparison of phonological descriptions is [not thereby] proven to be wrong: ... [it is] simply shown to be incomplete in essential aspects as [a] full reconstruction ... of the domain... of thought with which [it is] concerned" (Anderson 1979b:136/1980b:117). "The formalist program of SPE is undoubtedly incomplete as the basis of a comprehensive account of all problems in phonological structure in natural language...[that is, but] it still appears to constitute a well-formed and important subpart of that study, with real problems in its own right that can be formulated, addressed, and decided, and which lead to basic improvements in our understanding of the nature of sound systems" (p. 138/p. 118).

"[H]owever[,] an understanding of the role of substance in phonology can only come from an appreciation of the science of that substance[.]. ... to wit, phonetics. ...[N]ot all of the results of phonetic research are equally applicable...[though:] the most central sort of phonetic research is undoubtedly that which aims at a notion of phonetic motivation and explanation. ... The most promising sort of synthesis seems ... to be found in the works of Baudouin de Courtenay, the 50th anniversary of whose death ... [was] mark[ed] in 1979, [since it] ...integrat[es]... the explanatory role of traditional phonetics (in accounting for the entrance of low-level processes into the
system) with that of the study of the internal structure of grammars (in treating the relations, both evolutionary and synchronic, among the various sorts of rules) ..." (p. 141/120-121).

Thus, the adoption of the/an ERT--especially its source component--does not by any means entail a total rejection of the SPE/SGP program, but it certainly represents a substantially modified and supplemented version of that theory. Still, as observed in the body of the present work, one of the modifications and supplements thereby involved concerns the "internal structur[ing]... of [synchronic] grammars ... among the various sorts of rules". And explicating that linchpin aspect of the ERT (and thus of at least one version of current GP)--the typology of rules in sound structure--requires a return to the main text.
SECTION B
The Central Component of an Evolutionary Rule Typology: A
Synchronic Typology of Sound-Structural Rules
[= Chapters IV-VIII]

First Subsection
[= Chapter IV]
CHAPTER IV
Defining and Exemplifying the Four Sound-Structural Rule Types: Phonetic, Phonological, Morphological, and Lexical-Correspondence Rules

IV.0.
This chapter is primarily concerned with presenting past, current, and possible future characterizations for types of sound-structural rules, as well as with providing examples of these. It begins by considering the changing fate of rule types in the transition from American structuralist phonology to early generative phonology to more recent generative phonology and morphology. In this regard, there is also presented a short discussion of the arguments which can be used to support proposed rule types and particular definitions of them. (Such evidence is only briefly characterized here, however; it is presented in detail in the following four chapters.)

Next, the "phonetic" and "purely phonological" rule types are defined and exemplified (mainly following the work of S. Anderson and Sommerstein), and a likewise previously suggested category of "morpholexical" rules is provisionally introduced. Based on the work of López and others on lexical correspondences, though, this last category is then split into two separate sound-structural rule types: morphological rules and lexical-correspondence rules. The second of these two final types is also broadened so as to include, not only more or less isolated (and variably recognized) lexical parallelisms like Quixote/quixotic, but also nonproductive and exceptional morphological subregularities like sing/sang/sung, drink/drunk/drank, etc.
Finally, some suggestions are presented concerning potential revisions of the current quadripartite rule typology for sound structure. Discussed in this regard are the status of major syntactic categories as morpholexical entities or not, the problem of exceptionality, and the possibility that additional—or at least orthogonal—new rule types may evolve out of the most recent work in generative phonology and morphology (especially multilinear approaches). Still, in particular, it is concluded that the distinction between lexical and post-lexical rules in contemporary Kiparskyan "Lexical Morphology and Phonology" does not exactly correspond to—and so cannot replace—the distinction between phonological and phonetic rules in the present typology, although it should seriously be considered for adoption as a useful and important supplement.

IV.1. The Overt Rejection and Covert Recognition of Rule Types in Standard Generative Phonology (SGP).

The notion that there essentially are qualitatively different types of sound-structural alternations/rules has, with only one major exception, actually been a rather constant part of phonological theorizing since the time of Kruszewski (cf. Chapter II above) and even before. However, that single exception was the very significant and influential one of the SPE version of Standard Generative Phonology (SGP). And so what was, in a sense, a temporary deviation from general, standard practice is perhaps responsible for the fact that a sound-structural rule typology is still a somewhat unsettled and controversial concept in current phonological theory. It seems best to consider the SGP “aberration” at issue from the perspective of its immediate predecessor, American structuralist phonology (aka "taxonomic/autono-
mous/classical phonemics).

As discussed by Anderson 1974a and 1975, early generative phonology's (GP's) conspicuous break with its immediate predecessor in rejecting the classical phonemic level (as an intermediate stage between morphophonemics and phonetics/allophony) entailed also rejecting the therewith associated difference between morphophonemic (i.e., neutralizing) and allophonic rules. Early GP, then, appeared to recognize only a single kind of rule of sound structure--one of an extremely abstract general form:

\[ A \rightarrow B / X \left[ \begin{array}{c} Y \end{array} \right] Z. \]

This appearance was reinforced by the fact that the theory allowed phonological rules to contain grammatical information such as word boundaries and morpheme boundaries, as well as morpholexical features for morphosyntactic (inflectional/derivative) categories and even for arbitrary classes of lexical items. As later codified in SPE, this SGP tenet of "phonological rule homogeneity" expressed itself most clearly in the situation that absolutely nothing in the theory relating to the form, ordering, or application of rules turned on whether a given process referred to, e.g., [±coronal], [±Noun], [±partitive], [±long a-stem], [±4th-century French loanword], or [±Rule 37].

However, the latter part of SPE introduces--sneaks in, some would say--two other kinds of sound-structural rules: "readjustment rules" (already mentioned here briefly in Chapter I above) and "phonetic-detail rules". Re-adjustment rules, on the one hand, operate to convert a "syntactically motivated" surface structure into a "phonological[ly interpretable]" one. They do so by reducing the amount of labeled bracketing from proportions either un-
needed or excessive for the phonology, as well as by spelling out certain abstract morphosyntactic markers and features as the actual underlying segments likewise needed by rules of the phonology. Phonetic-detail rules, on the other hand, function to convert the categorial (binary) values of phonological features into the numeric, quasi-continuous scalar values of systematic phonetics, which can then be realized as actual articulations (physical phonetics).

Beyond readjustment rules and phonetic-detail rules, though, Anderson 1974a, 1975 argues that many works written in the SGP framework (though not SPE) both recognize a difference, within the set of phonological (i.e., non-phonetic) processes, between morphological rules and phonological rules proper and also assume that all the former are ordered before all the latter. As a result, however, GP has, in practice, ended up with a rather traditional division of sound-structural processes into at least three general types: morphological, phonological, and phonetic (=allophonic) rules. Not only do many works operate with such distinctions, though; it has also been argued--mainly in the works of Anderson--that rules of roughly these three different categories are subject to differing conditions on what formal shape they may have, which order they apply in, and how they apply. (On the other hand, it is no longer widely accepted that, as in the traditional view, all the rules of each type together form an ordered component of grammar.) In contrast to the position of SPE/SGP, then, evidence has been accumulating over the past decade in support of the opposing perspective: namely, that it does seem to make a difference whether a rule mentions, e.g., [+coronal] vs. [+partitive], or [+nasal] vs. [±nasal] (where n is a numeric value between 0 and 1--or equal to either), etc.
The upshot of the work done to date on typological distinctions among sound-structural rules is that there are several rule types which each represent a cluster of properties of form, ordering, and/or application. Distinguishing a particular rule as belonging to a given type, that is, is not simply a matter of labeling, since something follows from type assignment: a rule with such and such given properties may not have certain other particular properties—or must have them, for example. The properties in question are thus not randomly distributed, and the typology expresses this. A rule taxonomy would, tautologically and analytically, predict only that objects meeting particular definitional criteria should receive a certain name. But a rule typology, because it is founded on property clustering, predicts that a formal object meeting one particular criterion for a given rule type should meet all of the other potentially independent criteria in the cluster for that type—an eminently testable and falsifiable prediction.

It is in consequence of the state of affairs just discussed that the rule types which form the core of an evolutionary rule typology (ERT) in one version of current generative phonology (GP) can explicitly be claimed (as in Appendix II above) to be more empirically based and less aprioristic than the typologies of Natural Generative Phonology (NGP) and of Dressler's Polycentristic theory, or than Linnell's Functionally Based Typology (cf. Appendix II for references). In a fair number of open-ended classes of cases, that is, predictions about the form, ordering, and application of particular rules can be used to verify the assignment of such rules to particular types. This justification for the rule typology under consideration is thus not of the natural-situation, external-evidence, experimental kind sought by Stampe's Natural Phonology (NP) and Ohala's "[Phonetic-]Experimental Phonology"
(PEP)—both discussed above in Chapter II. But, given that the justification in question involves the interaction of certain properties of rules with other aspects of the internal organization of grammar that were motivated on entirely independent grounds and for other purposes, such justification nevertheless arguably deserves to be considered empirical.

Most of the rest of this chapter is devoted to presenting definitions and examples for the four rule types in the sound-structural typology of one version of current GP. In this regard, the types are defined primarily on the basis of the boundaries, features, and feature values that appear in the inputs, outputs, and environments of rules. The empirical validation of the types thus defined, however, is treated in the following four chapters (= V-VIII). That is, I will later list six previously suggested potential conditions on rules of sound structure and then review in detail the evidence which has been or can be brought to bear for or against each of them. After all, the primary focus of the present overall work is on the motivation which can be provided for an ERT, and so it is appropriate that the type-validating rule conditions be scrutinized here even to the extent that two of them each receive an entire chapter's worth of discussion. Thus, even though the relevant set of conditions was proposed and first motivated over ten years ago, its forming the core topic of a work like this one is justified by the fact that intervening empirical and theoretical developments in phonology now require an extensive reevaluation of all six conditions.

In the end, though, it can still be shown for each condition that, while at least one rule type accords with it, at least one of the three other main types of rules does not obey it. And the resulting differential configuration of which rule types are subject to which conditions can thus indeed demon-
strate that typological distinctions among precisely these sorts of rules are necessary if constraints on the form, ordering, and application of sound-structural processes are to be specified for exactly the right cases. All of this obviously depends, however, on first providing definitions and concrete exemplification for the four types of rules.

IV.2. Defining the Four Sound-Structural Rule Types.

IV.2.0.

Nearly all explicit rule typologies in current GP recognize at most three types of rules—one of which is morpholexical. Following some programmatic remarks in certain less explicit recent generative treatments of rule-typological questions, though, I will here ultimately advocate splitting the morpholexical type into separate morphological and lexical parts and thereby recognize four basic sorts of sound-structural processes. The following discussion is therefore organized in a corresponding way: first, three types of rules are defined and exemplified; then, the third type is bifurcated, and, lastly, further possible refinements and related issues are considered.


The American structuralist phonological division of rules into allophonic, morphophonemic (= neutralizing), and morpheme-realizational types must be acknowledged to have prefigured the rule typology of one version of current GP in some respects. The first formulation of an empirically based typology for sound-structural rules in GP, though, was given by An-
Anderson and Browne 1973 and Anderson 1974a, 1975. On this view, such processes are apportioned among "phonetic", "[purely] phonological", and "morpholexical" rule types. These three types were also taken up by Sommerstein 1977, who refined and reformulated them somewhat. Here, I will begin by also adopting these same three rule types. But, to repeat, I will later expand on brief general suggestions--by Anderson 1979a, 1980c/1981a, among others--and extract part of the content of the above third (= morpholexical) type in order to constitute it as a fourth type ("lexical-correspondence rules"). In isolation, this rule type has received a fairly extensive discussion in López 1979. However, the remainder of the processes in the former third type must thereby also simultaneously be reconstituted as the set of morphological rules.

Let us begin defining the four rule types by starting with "phonetic" rules. Anderson 1975:43 suggests that these are "... [all and only those] rules ... whose environments involve reference only to the phonological/phonetic makeup of segments in ... [a] string, together with the location of major (i.e., word or phonetic-[phrase] boundaries[,] ... and which specify non-categorial (numeric) values or non-distinctive features." Sommerstein 1977:206 reformulates this as follows: "A rule is phonetic if and only if (i) its structural description contains no reference to any non-phonological feature and no reference to any boundary weaker than word boundary... and (ii) it does not alter from + to - or from - to + [= "does not reverse the categorical value of"] the specification of any feature which is distinctively specified in underlying forms of the language [for any "segments affected by the rule"]...".

Following the latter formulation, I will next exemplify the phonetic/non-
phonetic distinction in rule type with a few brief illustrations. (More examples can be found in the works just cited.) Rules mentioning only scalar or non-contrastive binary values of features like [coronal], [back], [sonorant], etc. are phonetic; rules referring to any values of features like [Noun], [partitive], [14th-century French loanword], and the like are non-phonetic. Word boundaries and phrase boundaries (═ "#" and [one symbol for pause:] "‽") can appear in phonetic rules, but not morpheme boundaries or clitic ones (═ respectively "+" and, for some, "="). A rule specifying, say, the degree of frontness of velars (e.g., most front before /i/, less front before /æ/, etc.) would be phonetic by virtue of its producing an output with a non-categorical numeric value. Likewise, in a language with no underlying nasal vowels, a rule changing vowels to [+- nasal] before nasal consonants would be phonetic. However, in the same language, a rule nasalizing underlying oral consonants before nasal ones (with which they are in lexical contrast) would be non-phonetic. Clear English examples of phonetic rules are thus obviously vowel nasalization and velar fronting (cf. immediately above), as well as aspiration of voiceless stops and vowel lengthening before voiced obstruents (the latter also mentioned above in Chapter III).

(Purely) "Phonological" rules, on the other hand, are defined by Anderson 1975:42-43 as "... those whose environments involve reference only to the phonological composition of elements of ... [a] string, to boundary elements, and perhaps to major lexical class (e.g., 'before coronals', ... 'at morpheme boundary', 'in Nouns', etc.) and which furthermore operate so as to alter the categorial (+/-) value of some feature which is distinctively specified in underlying forms of the language...".¹

Sommerstein 1975:209, who allows "morphophonemic" as a synonym
for "phonological" (rules), suggests a few tentative minor revisions in the
above definition and reformulates it: "A rule which is not phonetic is phono-
logical (= morphophonemic) if and only if its structural description contains
no element other than: phonological features; boundaries recognized by
phonological theory; labels for major lexical categories such as 'noun' and
'verb'[and]. . . diacritic features relating to major vocabulary divisions such
as 'native', 'Chinese', 'learned'."

From these definitions, it is clear that the English Flapping Rule is phono-
logical, since it changes the categorial value of /t/ to "+' ("plus") for the
feature [voice], which is underlyingly contrastive for obstruents. Likewise,
the rule complex which accounts for assimilation and epenthesis in the reg-
ular English plural, etc. is phonological, since it involves the relatively con-
trastive feature [voice], only phonological boundaries, and insertion of a
whole segment--which, in creating a new feature matrix, certainly alters the
previous state of categorial values. A particularly widespread phonological
rule crosslinguistically is nasal assimilation: i.e., assimilation of nasals to
obstruents--usually following ones--in place of articulation. Since place-of-
articulation features are often underlyingly contrastive for nasals, the assimi-
lation in question thus often alters distinctive categorial values. However, if
a rule of sound structure performs some categorial change of a distinctive
feature not only at a phonological boundary--say, "+'--but also partially on
the basis of a conditioning morphological feature, then that rule is not pho-
nological but rather morpholexical.

Sommerstein 1977:209 gives "morpholexical" rules the following brief,
negative characterization: "Rules not meeting ... [the] requirements for
phonetic or phonological rules ... are morpholexical." Anderson 1975:42
gives a positive and much more extensive definition for morpholexical rules, which he takes to be "... rules ... whose environments involve essen-tial reference to the identity of specific items] (e.g., 'in plurals', 'before 1s[.]... pres. indic.', 'after {OX}', 'before an Aspect Marker', etc.)...."

Thus, rules that mention morpheme boundaries need not be morpholexical, but ones that mention specific morphemes or words necessarily are so. For example, consider the English rule (briefly mentioned above in Chapter I) which accounts for the fact that (among other segments) underlying /d/ and /t/ in words like decide and permit, respectively, alternate with [s] before the ending -ive; cf. decisive and permissive, etc. This is clearly a morpholexical generalization concerning primarily the morpheme -ive—not one about the overall phonology of English. And, even more clearly, whatever rules account for facts like the plural of child being children, and the "derived" nominalization of laugh being laughter, are just morpholexical generalizations, not phonetic or phonological ones. Finally, one might (again, as already briefly in Chapter I) mention the example of English "Velar Softening", which accounts for alternations like electrī[k] ~ electrī[s]īty. This morpholexical rule does not by any means apply to all velars before all non-low front vowels—there are, after all, words like psyche and picky, key and kill—but only to velars in certain morphemes before particular affixes.

IV.2.2. Splitting Morpholexical Rules into Morphological and Lexical-Corre-spondence Types.

IV.2.2.0.
In the brief discussion of the theory of NGP presented above in Appendix II, it was mentioned that this framework also employs a rule typology: viz., one recognizing "phonetically based" "phonological" "processes" (P-rules), "morphophonemic" generalizations (MP-rules), and "via" rules. Each of these has a definition quite different, however, from those just given for the rule types of the ERT in one version of current ("Revised Standard") GP—even for types with the same name. NGP's "phonological" and "morphophonemic" rules, we will thus not wish to consider within the present context. But its via rules point in the direction of a rule type that we in fact will want to incorporate into a current generative-phonological typology: "lexical-correspondence rules".

To the best of my knowledge, it was Vennemann (genannt Nierfeld) 1972a who introduced the notion of via rules into GP. Since the same work in fact introduced a full sound-structural rule typology, Vennemann is probably also to be credited with proposing the first overt, explicit generative rule typology overall. However, as remarked above, Anderson and Browne's 1973 and Anderson's 1974a, 1975 proposals actually constitute the first such empirical typology of sound-structural rules, due to their less taxonomic and less aprioristic nature. In any case, Vennemann 1972a:225 proposed that "... grammars may contain phoneme correspondences, called via rules, which are never utilized in actual sentence generation but serve the sole function of relating lexical items to each other."

The name for this device comes from the fact that the entry for any lexically listed form may contain the information that the item in question is morpho(phono)logically related to another form (or forms) via such a rule. In fact, Vennemann 1972a further proposed that "generative" rules could
also be used as via rules, but that is not really relevant at this point in our discussion.

Rather, what is relevant for our present purposes is that via rules were intended to capture morphological relatedness of forms in cases where the sound-structural alternations between the items involved are non-systematic, non-productive, non-obligatory, (in the sense that there may be doublets), and perhaps even non-directional. Thus, McCawley's 1979 example of the marginal English alternation between (Don) Quixote [ˌkʰiˈhoʊDi] and quixotic [ˌkʰiˈsjʊIksɪˈDɪk]—with /k/ ~ /kw/ and /h/ ~ /ks/—is perfectly suited for expression by via rules. That is, it involves a pair of totally idiosyncratic, essentially arbitrary sound patterns which nevertheless do not seem best treated as suppletive, even though they are in fact unique.

Numerous similar examples—though perhaps not quite such extreme ones—are provided by the many cases where speakers of a language borrow from a related language and/or from an older, archaic stage of their own language's history. Thus, English has, e.g., borrowings from Latin and Greek which can be related to corresponding native forms only by, among other processes, a synchronic analog of Grimm's Law: cf., for example, father ~ paternal and the roots in acknowledge ~ agnostic, etc. This phenomenon, though, is by no means limited to Germanic or even Western European languages (as exemplified, additionally by Spanish borrowings from Latin). It is also common in Slavic (cf., e.g., the Old Church Slavic component of Russian) and Indic languages (with their many borrowings from Sanskrit), as well as in non-Indo-European languages. In nearly all such cases, too, the sound-structural rules needed to account for the sound alternations involved are isolated, frozen, and relatively unpredicta-
ble—in short, qualitatively different from most of the rest of sound structure in the relevant languages, especially their phonological rules proper.

However, while the device of via rules seemed ideal for expressing this different kind of sound pattern, Vennemann (and, after him, B[ybee] Hooper 1976) went farther, also using via rules in order to express alternations like some of those associated with the English "(Great) Vowel Shift". Thus, for instance, in order to relate pairs like sane ~ sanity, tone ~ tonic, etc., Vennemann 1972a:229-230 posited the via rules $\ddot{e} \rightarrow \varepsilon$, $\ddot{o} \rightarrow a$, etc. As B[ybee] Hooper 1979:107-108 later put it: "All alternations that are the residue of unproductive processes[, that] amount to no more than lexical correspondences which become more remote as time passes...[, that] go along with morphological processes that are no longer productive...[--alternations like] the English vowel shift and velar softening rules...[--are] described in via-rules, which do not change one form into another... but merely state the relation that holds between the forms both semantically and phonologically."

Many other phonologists, though (e.g., Leben 1979), have argued that analyzing such sound patterns purely as via rules constitutes an improper extension of that device into the domain of more normal—certainly, more widespread, productive, and systematic—phonology and morpho(phono)logy. English Vowel Shift, on the one hand, and idiosyncratic alternations like was ~ were, grind ~ grist, on the other hand, are—it can be claimed—different in significant enough ways that they should be assigned to different rule types. Largely as a result of this situation, via rules have not been widely employed or even discussed outside of NGP.

However, this means that the identifiable and conspicuous class of ca-
ses that originally provided the major motivation for via rules in the first place cannot now be isolated and expressed as a rule type of its own. Rather, rules like those relating, say brother and fraternal must be lumped together, as morpholexical rules, with all of the other sound patterns in that type, irrespective of the vast differences that exist between them in terms of productivity, predictability, and generality.

IV.2.2.1. López' Model Set of Lexical-Correspondence Rules.

It thus seems strongly desirable to remedy this situation where there exist unexpressed differences between sporadic frozen alternations and all others—and thereby to capture Vennemann’s original insight regarding the former sort of allomorphic relationship. López 1979 therefore introduced the notion of (lexical) "correspondence". A major part of that work is in fact dedicated to justifying correspondence and correspondence rules, both of which López motivates with reference to the sound structure of Brazilian Portuguese (Carioca [= Rio de Janeiro] dialect). But she also devotes considerable attention to developing a formal mechanism for handling correspondence rules in a grammar.

López 1979:6 defines "correspondences" as "... bidirectional lexical relationships between underlying segments ...[whose a]lternation is non-governed--a given morpheme turns up with segment X in one form and the corresponding segment Y in another form...[,] but it could just as well have turned up with X in both. The forms may be related inflectionally... [or] derivationally or as near synonyms .... Co:respondences occur in many morphemes and, though non-rule-governed, are part of the sound pattern of the language. They are suppletive insofar as they are lexical, but they are
non-suppletive--non-idiosyncratic--insofar as the grammar contains statements[,] similar to redundancy rules[,] which simply indicate] that certain correspondences exist."

López further states that "...[cor]respondences... [are] by definition both random and non-derivational..." (p. 7). "...[T]heir alternations...[are] too sporadic to be rule[-]governed..." (p. 8). "...[C]orrespondences form a set of phonological redundancy rules parallel to morphological and semantic redundancy rules. ...[They] exist whenever a set of alternations exists; the concept of productivity applied to phonological rules does not apply... [to correspondences]."2 "Nevertheless..., ... correspondences are psychologically as well as formally part of ... synchronic grammar..." (p. 10). "What distinguishes correspondences from other types of phonological alternations is precisely that they are nongoverned, unpredictable." "Correspondences are associated with phonological contexts... [which] are permissive rather than determinatory" (p. 188).

López 1979 discusses myriad examples of correspondence from Carioca Brazilian Portuguese. Here, I will cite just three (from p. 188):

mutismo ~ mudez (synonyms for 'quietness; muteness'), where different endings correlate with a [t] ~ [d] alternation; permutar ~ permudar (synonyms for 'to exchange; communicate'), again with [t] ~ [d], and palacio ~ paço ('palace; mansion' ~ 'palace; court'), in which there is an alternation of the lateral [l] and the vowel a with ɨ, as well as /sI/ ~ /s/. From both López' examples and her discussion, it is clear that her general device of "[lexical-]correspondence [rules]" is just what we want and need in order to handle the sporadic, unpredictable, unproductive cases of alternation discussed here and earlier in this section (although we do
not need López' somewhat contradictory abovementioned apparent requirement that correspondences must "occur in many morphemes"). And so lexical correspondences will be adopted in the present work as the core of a fourth type of sound-structural rule. That is, at least some of the lexical part of the former set of morphological rules is to be extracted and constituted as a rule type in its own right. We will thus later need to return to consider the remainder of the original group of morpholexical rules, which have hereby ended up much more morphological and much less lexical than before. In splitting the former set of morpholexical rules in this way, I expand on the suggestions of de Chene and Anderson 1979 and Anderson 1980c/1981a, where at least a descriptive distinction is made (e.g., on p. 531 of the former work) between "morphologically-conditioned variations... [and their reflexes, which may] eventually be relegated to the status of unproductive, merely lexical, correspondences among forms"). But, for now, let us turn our full attention to the set of lexical-correspondence rules.

We can begin by provisionally assuming López' 1979 general treatment of correspondences (except, to repeat, for her seeming requirement that each correspondence have multiple instantiations). In essence, López simply states redundancy-rule-type correspondences between recurrent but lexically limited alternants. Thus, e.g., for the first two sample alternations given above from the Carioca dialect of Brazilian Portuguese, López simply formulates the non-directional lexical-correspondence rule /t/ ↔ /d/- i.e., /t/ and /d/ may allomorphically alternate with each other in lexical representations. It seems appropriate to adopt that notation here, too. But not following López' practice of ruling out non-recurrent sound patterns as
exemplars of the lexical-correspondence rule type represents an important improvement, especially since she offers no particular grounds for that practice. In fact, if anything, completely isolated alternations (like Quixote/Quixotic) are the prototypical cases for which lexical-correspondence rules can and should be posited.

This short discussion of López 1979’s framework for lexical-correspondence rules by no means does full justice to the excellent specific treatment given such processes in that work, to which the reader is hereby referred for more extensive discussion. However, in introducing material from her research, I do hope to have provided sufficient initial justification for including such rules in the ERT—as (at least the core of) the last stage in the lifecycle of sound-structural alternations. López 1979:8 et passim in fact explicitly stresses this aspect of correspondences: some "are the result of borrowing", but many "are primarily the result of the death of phonological rules".

That is, the last stage before a sound alternation is no longer recognized—and thus "dies"—is often one where it exists only as an isolated relation between two forms of a morpheme or word. In this connection, I should add the further remark that the inventory of lexical-correspondence rules in particular grammars is quite probably subject to more individual variation than most aspects of sound structure. Many English speakers may not recognize any correspondences between forms like grind ~ grist or bake ~ batch, for instance, while a few others may do so, and some rare individuals may even perceive cow and beef to be morphologically related—since they actually are cognate. However, regardless of how appropriate lexical-correspondence rules may be for expressing connections as extreme and tenuous as this one, it is still unlikely that many—if any—speakers
perceive morphological relationships of the sort just mentioned. For those unpredictable, non-directional, unproductive sound patterns that are perceived, though, we can adopt the sound-structural type of lexical-correspondence rules.

IV.2.2.2. Extending the Scope of Lexical-Correspondence Rules to Irregular and Non-Productive Morphological Alternations.

As is evident in the quotations from López 1979 given above, that author obviously considered lexical correspondences to be primarily phonological in nature—not morphological or semantic. Nevertheless, it becomes clear upon reflection that such fossilized alternations are no more phonological than any of the rest of sound-structure. That is, to characterize lexically isolated relationships as phonological simply because they involve sounds is to engage in the fallacy discussed here in Chapter I above, since nearly all of language involves sound at some level. Moreover, most lexical correspondences actually are at least partially semantic, after all. It is admittedly true that there are some alternations, like English /ε/ ~ /i/ in the first syllable of economic(s), which simply involve apparently free variation in the pronunciation of a single word—without any associated difference in meaning. But most correspondences involve pairs (or larger sets) of lexical items which are associated with different meanings, so that the phonological alternations between (and among) such forms can minimally be said to have partial semantic conditioning. Indeed, lexical correspondences relate lexical items—especially morphemes and idiosyncratic words—to one another, and it is generally thought that both of these latter usually involve combinations of sound and meaning.
Thus, let us now assume that the set of lexical-correspondence rules can be defined as including all non-productive sound-structural alternations which are morphemically or at least lexically limited. Then, the question immediately arises as to whether more morphological-seeming but still lexically limited and non-productive patterns like English *sing/sang/sung*, *drink/drunk*, etc. do not also involve lexical-correspondence rules. In fact, there do not seem to be any compelling arguments against answering this question affirmatively. The correspondence of present /ɪ/; past /æ/; and perfect /ʌ/ does recur, but it represents precisely an exceptional, lexically limited subregularity of English sound structure. And it certainly is a non-productive pattern, given that it is never used in the creation of new forms except for jocular purposes.

Hence, if lexical-correspondence rules are to be defined—roughly following López 1979—as involving non-productive, lexically limited relations of allomorphy that exist between forms listed in the lexicon, then the set of such correspondences must additionally include, not only the rules relating such pairs as *Quixote/quixotic*, but also the rules expressing patterns such as *sing/sang/sung* and the like: e.g., /ɪ/ ⇔ /æ/ ⇔ /ʌ/. In reaching this conclusion, we thus end up with a notion of lexical-correspondence rule which returns much more closely to the conception of via rules originally proposed in NGP by Vennemann and B[ybee] Hooper.

Indeed, a similar approach was also earlier adopted by Lieber 1980/1981, for whom unproductive, irregular sound-structural correspondences form part of the set of redundancy-like "morpholexical rules"—although productive and regular alternations constitute the rest of that rule set. Similarly, Anderson 1981b:34, 38/1982a:608 (commenting on an analysis taken from
an earlier draft of the present work) mentions "...[d]erivational rules, operating within the lexicon, [which] can describe the systematic relations among stems in the case of irregular stem-alternation patterns, without requiring us to claim that these cases are not distinct from fully suppletive listing."

On this view, then, the lexical entry for a word like the English verb **sing** consists of a list of three allomorphs: \( /\text{s}\text{i}\text{ŋ}/ \), which is literally the unmarked form; \( /\text{s}\text{æ}\text{ŋ}/ \), which bears the feature marking [+Past], and \( /\text{s}\text{ʌ}\text{ŋ}/ \), which is marked [+Perfect]. The three items are shown to be co-allomorphs by the fact that, among the set of redundancy-expressing lexical-correspondence rules in the lexicon, there is a rule which allows them to be related to one another. Following the above suggestion by Anderson, suppletion can then be regarded as that situation where two forms of the same lexical item (= word) cannot be mutually related by any correspondence rules and so must be evaluated as representing entirely different morphemes.

In the case just discussed, the use of morpholexical features to label the various stems (other than the unmarked, basic one) turns out to be crucial. This is because we presumably do not wish to claim that all English words which differ only in the relevant vowel-qualities are--even potentially--related as co-allomorphs of one another by the exclusively phonological (sound-referring) lexical-correspondence rule \( /\text{i}/ \iff /\text{æ}/ \iff /\text{ʌ}/ \). For example, we certainly want to reject a grammar in which English **ding**, **dang** (it, etc.), and **dung** are all claimed to instantiate the same morpheme. (A similar argument in this direction is given by Thomas-Flinders 1981b:167.) But this necessity of labeling stems in the **sing/sang/sung** case then suggests an improvement in handling the more lexical sorts of
correspondence rules discussed by López 1979. That is, unless certain sporadic and non-productive alternation patterns in stems truly hold across a range of accompanying morphological and semantic contexts, it is surely preferable to constrain the grammar by building such morphological and semantic contexts into the lexical-correspondence rules themselves. Thus, the English rule under consideration is better expressed as follows:

/ɪ/ $\iff$ /æ/[\+Past] $\iff$ /ə/[\+Perfect].

The use of lexical-correspondence rules in conjunction with lexical listing of irregular, non-productive patterns of allomorphy has several advantages which should be mentioned before we turn to the as yet undiscussed remainder of the former morpholexical rule type--namely, the set of productive morphological rules.

First, an approach which employs lexical listing of irregular forms and utilizes lexical-correspondence rules in order to express subregular redundancies between them receives independent motivation from the fact that even certain regular morphological rules must apparently sometimes be used for such a parsing, redundancy-expressing function. (To repeat, a parallel suggestion for phonology actually was already made by Venne-mann 1972a.)

For example, the English words guts in the sense of 'courage' (cf. Strauss 1982) and dogs in the sense of 'feet' are both clearly plural, but--at least in the speech of many people--there are no corresponding (= semantically appropriate) singulars. One analytical possibility for such cases involves listing gut and dog in the lexicon with each having a single, singular entry marked for the semantics of the plural and also for some feature which triggers or at least requires pluralization. Nevertheless, it seems pref-
erable to list the entire plural forms guts and dogs in the lexicon, along with the appropriate meanings, and to employ the regular English pluralization rule in a parsing, redundancy-expressing function. In this latter way, one can express the fact that the -s at the end of the words in question is the same suffix productively added in less idiosyncratic words like huts and bogs.

A similar case concerns likewise partially regular and partially irregular morphological forms such as the English word untruth. As will be shown below, examples of this kind are particularly troublesome for theories of word formation in which all morphological elements are analyzed as being added by productive rules—that is, where no major distinction is made between regular, productive processes vs. irregular, non-productive ones. On such an approach, there is virtually no lexical listing of idiosyncratic morphologically complex forms (at least, on the most underlying level or stratum of the lexicon). Rather, all such forms are derived by rule, and the only significant differences between the rules have to do with the different levels at which they apply. Such a theory is the Lexical Morphology and Phonology (LMP) briefly mentioned in Chapter I and at various other places above (cf., e.g., Kiparsky 1982a, 1982b, the relevant articles in Phonology Yearbook 2 (1985), and the references in all those works).

As pointed out even by Kiparsky himself, the problem caused for this kind of theory by words like untruth is that un- in deadjectival nominalizations is usually analyzed as added to adjectives, not to nouns. Thus, un- must be added to true, not to truth, and so the suffix -th must apparently be added to untrue later. However, it is claimed in LMP that -th, being a more frozen suffix of English, is added at an early stratum, while the
quite productive prefix un- is added at a late stratum. Such a paradox can be avoided, though, if the form untruth is simply listed in the lexicon as a complex entry, with separate morpholexical rules allowed to parse its redundancies. Thus, a non-productive morpholexical redundancy rule for -th can account for that aspect of untruth, while the prefix there can be accounted for by using as a redundancy rule the otherwise productive morphological rule for un-.

Third and finally, the use of lexical-correspondence rules (and lexical listing) for the interrelating of irregular, non-productive allomorphs permits exactly the right analysis to be provided for cases where there is an apparent conflict between regular and irregular rules marking the same morphological category. This topic forms most of the subject matter of Chapter VII below—which concerns the so-called "Elsewhere' Condition"—so only a brief characterization of the relevant argument is needed here. In brief, it turns out that the interaction of lexically free morphological rules with one another is not subject to the Elsewhere Condition, while the interaction of lexically free rules with lexically limited ones does obey that constraint. That is, in the manner sometimes called "Blocking" (cf. Aronoff 1974/1976), the existence of an irregular, lexically listed form parsed by a lexical-correspondence rule prevents the operation on that form of an otherwise applicable regular, productive morphological rule. It is this differential status of lexically limited and lexically free morphological rules vis-à-vis the Elsewhere Condition which thus in fact provides some of the strongest evidence for splitting the former morpholexical rule type into separate lexical-correspondence and morphological rule types—the latter of which we must now briefly consider.
IV.2.2.3. Defining the Last Sound-Structural Rule Type: Morphological Rules (Proper).

Morphological rules (proper) can be defined—or redefined—as those sound-structural processes which are productive and whose environments make essential mention of particular morphological categories, morphemes, and/or lexical items, or of classes of any of these—with the proviso that such environmental mention does not specify the lexical identity of a particular root (or class of roots) itself directly affected by the relevant process. (Obviously, a rule which violates this proviso is, instead, a lexical correspondence; see above.)

At this point, a word is in order about the difference between reference in a rule to morphological categories vs. reference to morphemes. Following work by Kiparsky and Halle 1977, Kenstowicz and Kisseberth 1979: 403-405 discuss an accentual rule of Russian which is triggered by several different morphemes that bear the feature [+Plural]. Since the stress retraction process in question operates irrespective of the morphemic identity of the various plural morphemes, Kenstowicz and Kisseberth argue convincingly that that accentual rule should be treated as conditioned by the feature [+Plural], rather than by a disjunctive set of specific [+Plural] morphemes. The Russian rule is thus one whose environment mentions a particular morphological category, expressed via a particular morphological feature.

A contrasting example is presented by Janda 1981b/1983a, who discusses the fact that Old High German had two comparative suffixes (−ir and −ōr)—only one of which triggered the language’s already morphologized Umlaut rule. Accordingly, the Umlaut process which occurred in Old
High German roots preceding the -ir- comparative marker must be written so as to be conditioned by that specific morpheme, not by the feature [+Comparative] in general. The latter rule is thus one whose environment mentions a particular morpheme (or at least a particular allomorph).

It should also especially be noted that the above definition of morphological rules--along with the previously given definition of lexical-correspondence rules--totally excludes the possibility that there exist any so-called "morphologically conditioned phonological rules". This is because, by the above characterizations, any process which makes crucial reference to morphological or lexical elements is ipso facto a morphological or a lexical (i.e., a morpholexical) rule. Thus, it should be stressed that the set of morphological rules (proper) involves more than just operations that initially spell out the realization--in sound--of one or more morphological categories (as in the regular English -s pluralization rule already mentioned here several times previously). Rather, that set also includes processes which mark morphological distinctions by operating on phonological material which has already been spelled out by other rules.

Some examples of this latter type were already provided in Chapter I above (e.g., the metathesis of a -t- infix in Akkadian). For further illustrations, extensive discussion, and references, see Hoeksema and Janda 1985. Both that source and the first chapter of the present work also present exemplification, discussion, and numerous references concerning the extent to which in fact all non-root morphemes are best replaced by rules couched within the conceptual and linguistic framework of process morphology. (For example, Chapter I here mentions morphological processes of substitution in the Javanese elative, deletion in the Rotuman incomplete
phase, and metathesis in the Clallam actual aspect.) There remains to be presented below, however—in the following three chapters (V-VII)—evidence showing that empirical considerations concerning the form, ordering, and application of sound-structural rules also support the rejection of putative "morphologically conditioned phonological rules" in favor of completely morphological processes.

Also as already discussed earlier, in Chapter I, it is now generally accepted that morphological rules are intermixed with some phonological rules in the lexicon, but that other phonological rules are post-lexical (i.e., post-syntactic). There is disagreement, however, about whether any morphological processes are post-lexical. Of current theories, Anderson's "Extended Word-and-Paradigm" (EWP) model seems to be alone in claiming that regular rules of inflectional morphology operate post-syntactically. Part of the evidence that can be adduced in this regard depends, of course, on the relevant theory of syntax concomitantly assumed. There certainly now exist numerous so-called "monostratal" approaches to sentence structure which apparently make it unnecessary to think that either derivational or inflectional word formation takes place outside the lexicon. In what follows, I will tacitly give provisional acceptance to such a view, although I believe that nothing whatsoever of any consequence for this work follows from that decision.

The rule type of morphological processes (proper) is a rather straightforward one, and so we can now quickly close our discussion of it—and thus of all four types of the sound-structural rule typology in general. However, the fact that lexical and post-lexical rules were just considered vis-à-vis morphology suggests one final remark on that score—albeit one con-
cerning lexical and post-lexical phonological rules. To wit: it could be speculated that the post-lexical vs. lexical distinction made in Lexical Morphology and Phonology (LMP) might correlate with the distinction between phonetic and phonological rules (proper), respectively, in the present typology of sound structure. If this were so, it might even be argued that the latter distinction can be replaced by the former, since the differing properties of the two types of rules could then be said to follow from their "location" in a grammar, rather than being stipulated on the basis of their different features, environments, etc. However, an equation of phonological rules with lexical rules, and of phonetic rules with post-lexical rules, would simply be empirically incorrect, since there apparently exist both phonetic (i.e., allophonic) processes in the lexicon (= lexical phonetic rules) and also post-lexical phonological rules.

For example, recall that phonetic rules are here defined as essentially allophonic ones, while phonological rules are essentially neutralizing rules. Thus, English flapping is indisputably a rule of neutralization and hence (purely) phonological, even though it has been argued to be post-lexical (e.g., because it applies across the boundaries of words and phrases—as in Peter Ladefoged's example Dead-headed Ed had edited it). Similarly, the Javanese derivational-morphological process of elative formation discussed in Chapter I above clearly must be a lexical rule, but it is argued at length by Dudas 1974, 1976 that elative formation is preceded by at least one allophonic—hence phonetic—rule of Javanese. (The likewise preceding Javanese rule of raising/rounding presented here in Chapter I is, however, neutralizing and so phonological.) Consequently, LMP's post-lexical/lexical distinction simply cannot be equated with the phonetic/phonological
distinction made by the present sound-structural rule typology—the nature of
and evolution between whose types we will later consider here in more de-
tail (= in Chapter IX below).

Still, the study of how and why LMP's post-lexical phonological rules
may possibly evolve into lexical ones remains an intriguing subject for in-
vestigations—perhaps future ones—carried out elsewhere than in the pres-
ent work. The next and final section of this chapter in fact discusses a num-
ber of similar further considerations, in addition to summarizing the conclu-
sions reached here concerning the four types in the current rule typology for
sound structure.

IV.3. Clarities, Unclarities, and Possible Future Refinements in a Current

Generative Typology of Sound-Structural Rules.

Phonetic, phonological, morphological, and lexical correspondence
rules represent, then, probably the most widely studied types of sound-
structural processes; these are definitely the most widely accepted types.
They each contain a very clear class of central rule cases—more or less pro-
totypes—from which there can be a shading-off toward other rule types.

Thus, for example, there can be little doubt about the status and type
membership which should be assigned to the class of phonetic rules that
includes the generalizations accounting for the minute but consistent and
significant differences in height found for "the same vowel" across different
languages and even across dialects of the same language (cf., e.g., Disner
1978 and her references for documentation of the facts).

Similarly, the status as a phonological rule of the process "intruding" /r/
into certain hiatus environments (especially across word boundaries) in
many dialects of English—particularly British ones—can hardly be questioned, since the phenomenon seems oblivious to both morphology and phonetics (e.g., even subsequent deletion of one or both of the conditioning vowels!: cf., e.g., Cuba(r) 'n' Chile as [ˌkjuˈbrən'ðIli]). And clearer still is the (purely) morphological nature of generalizations like, e.g., the regular English past-tense suffixation rule for -ed, or the status as lexical-correspondence rules of singular vs. plural alternations like that of leaf vs. leaves (contrast reef vs. *reeves/reefs and also the well-known neological form in Toronto Maple Leafs).

However, there remain numerous points on which further investigation is needed in order to clarify the rule typology, even just for phonetic, phonological, morphological, and lexical-correspondence rules.

First off, there is the matter of whether it actually is valid to make allowance—as above—for mention, in phonological rules, of features designating major lexical classes (like [Noun]) or vocabulary divisions (like [Latinate]). Neither Anderson 1975 nor Sommerstein 1977 bases the inclusion of such features in the phonological set on any particular evidence—such as the justification of phonologicity by demonstrating the relevance of properties of form, application, or ordering to rules containing such features. Instead, there seems simply to have been a supposition on the part of those scholars that finding such justification would not be unexpected, as well as an apparent intuition that, in some vague sense, the vocabulary divisions and lexical classes in question are less morphological than, say, derivational and inflectional categories or arbitrary lexical classes. Sommerstein 1977: 209, for example, states that "...[a] rule will not, except by accident, serve to provide an exponent for a morphological element or category merely be-
cause it applies to forms in some major vocabulary divisions to the exclu-
sion of other such divisions."

The inclusion of lexical-class and vocabulary division features among
the set of permitted pieces of information referred to by phonological (as op-
posed to morpholexical) rules, then, was originally intended only as a plau-
sible suggestion having a possibility for empirical verification. But the over-
all (evolutionary) rule typology here being espoused would actually be little
affected by a finding that the features in question have to be typologically
realigned. In fact, I will later present evidence suggesting that the appear-
ance of [*Noun], [-Verb], and/or similar lexical-syntactic categorial fea-
tures in a sound-structural rule disqualifies such a process from being pure-
ly phonological and instead makes it morpholexical (i.e., a morphological or
lexical-correspondence rule). Anticipating the arguments to be presented
along these lines below (in the following Chapter V), I will here just briefly
report that, if features designating major lexical-syntactic categories are
evaluated as morpholexical, then it is apparently possible to eliminate all
the potential counterexamples which appear to violate the claim that purely
phonological rules are never sensitive to the total number of syllables in a
word. And this is an especially desirable finding because several morpho-
logical rules already are independently known to be "syllable-totaling".

Perhaps more important, however, is the whole vexing issue of excep-
tionality. If phonological rules can have exceptions--in the form of particular
lexical items which do not undergo them--then one could claim that the
specifications needed to exempt the exceptional items from the relevant
rules constitute non-phonological features/information. But this might actu-
ally imply that the rules in question are morpholexical. And, in various pub-
lic forums (although not--to my knowledge--in print), Anderson has even
raised the possibility that phonetic rules could have lexical exceptions,
whereby he has pointed out that this phenomenon is essentially unstudied
rather than unrewardingly exhausted.

Anderson's suggestion is that, if such phonetic exceptions were found,
it would indicate that exceptionality is independent of the phonetic/phon-
ological/morpholexical distinction. Even without such arguments from pho-
netic rules, though, it seems preferable to separate the issue of exception-
ality from that of defining rule types until clearer evidence is found. A promis-
ing line of research in this regard would be to adopt--from LMP--Kiparsky's
1982a, 1982b combined use of lexical underspecification for phonological
regularities and lexical overspecification, as it were, for phonological irregu-
larities. Given this situation, the abovementioned Elsewhere Condition can
then be invoked in such a way that the presence of irregular features and/
or segments in lexically listed forms blocks the application of later phono-
logical rules whose operation otherwise accounts for regularities.

This is, of course, exactly parallel to the morphological use of the Else-
where Condition mentioned above (and to be discussed at length in Chap-
ter VII below). In such cases, too, the existence of a lexically listed allo-
morph blocks the later application of a general (i.e., lexically free) rule--al-
beit one of morphology. However, in such cases of morphological blocking,
the irregular forms in the lexicon are accounted for by lexical-correspon-
dence rules, and so the relevant disjunctivity can be attributed to a kind of
conflict between two types of rules. In LMP's use of lexical listing as a way
to block the application of phonological (and possibly phonetic) processes,
though, no apparent lexical rules or (true) generalizations are involved

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which such processes could conflict with. Indeed, one of the prime motivations for the whole approach at issue is to obviate the need to use rule exception features in the lexicon.

Thus, this whole question of phonological (and possibly phonetic) exceptions has to do mainly with quite specific properties of one (and possibly a second) sound-structural rule type, instead of with the general properties which set off the various types from one another. I will therefore not pursue matters concerning phonetic and phonological exceptionality any further here, since the focus of the present work is precisely on mutually distinguishing the four rule types of sound structure, rather than on exhaustively characterizing all the properties of any one type.

Another promising topic for future rule-typological research concerns the constituents of phonological analysis—internal as well as external: that is, both features and other, larger units, such as syllables, feet, phrases, etc. In regard to the latter: as Metrical Phonology (cf. the earlier references in Appendix II) and other "syllabic" approaches to sound structure (e.g., NGP) deepen our understanding of the higher-order elements of phonological representations, it will undoubtedly be possible to make a motivated extension of the type definitions for sound structure so as to accommodate rule subtypes based on reference by processes to syllables, feet (as syllable groups), phrases, and perhaps even other higher-level constituents. And, what is more, it is of course already possible even now to do away with boundaries per se (i.e., as quasi-segmental items in the linear string). Thus, reference to different kinds of boundaries can be replaced with references to the membership of features and segments in suprasegmental constituents (indicated by association lines) for all those cases where boundaries
are mentioned in definitions of sound-structural rule types like those given above.

On the other hand, in line with the development of Autosegmental Phonology (again, cf. the references given previously in Appendix II), it will undoubtedly also prove necessary to incorporate autosegmentality of features (for, e.g., tone, vowel harmony, nasalization, etc.) into the definitions of the rule types—whereby this may, again, result in several rule subtypes. A further possibility in regard to features is that it may eventually be possible to refine the definition of phonological rules by establishing a universal list of features that are always distinctive in the sound systems of languages. Thus, e.g., perhaps the major-class and tongue body features are always distinctive, while (most?) other features are never so. But, again, this all awaits further investigation, and the purpose of discussing it here is partly to draw attention to the issues involved—and thus possibly to interest others in pursuing such an avenue of work.

In any case, there certainly is no shortage of opportunities for further research which can profitably be explored in connection with the overall synchronic typology for sound structure that has been presented in this chapter. And it may well also turn out that there is both a possibility and a need for other rule typologies completely orthogonal to the current one. Several dimensions for such further systems have already been mentioned in the preceding paragraphs: the subsegmental and suprasegmental constituents of Multilinear Phonology, the phonetic/phonological content of features, and LMP’s distinction between lexical and post-lexical rules. Furthermore, these new typologies can be investigated from a diachronic perspective parallel to that which informs the ERT adopted here.
Still, though, all this research has to be reserved for other times and places. At the moment, an ERT of the kind laid out here within the framework of recent GP is currently the only rule system for sound structure which is subject to empirical verification through investigation of the differential properties of form, ordering, and application possessed by its four rule types. The following Second Subsection of this Section B in Part Two of the present work—that is, the next four chapters (= V-VIII)—must therefore be devoted to considering precisely these contrasting properties of phonetic, phonological, morphological, and lexical-correspondence rules.

To repeat, the six properties at issue were first discussed by Anderson and Browne 1973 and Anderson 1974a, 1974c, 1975, 1979a, 1985. However, many as yet unanswered challenges to these treatments have been presented in the time intervening between then and now, and it is of course always both possible and desirable to find additional support even for uncontented proposals. The major contribution of the current work is therefore intended to be its providing new data and argumentation that can both meet previous objections to a version of GP incorporating a specific ERT and also strengthen the typology in other ways.

To that end, the following Chapter V briefly considers (though not in the following order) the variable applicability to the rule types of four different constraints on sound structure: the "Weaker Crossover Condition" of Howard 1972a/1972b/1972c, the "Alternation Condition" of Kiparsky 1968b/1968c/1973a and its descendants, and two other restrictions—one on syllable-totaling rules (cf. the brief mention of these above) and one on "mirror image rules". On the other hand, Chapter VI is devoted entirely to discussing a constraint on "exchange rules", while Chapter VII is exclusively
concerned with the Elsewhere Condition already mentioned here several times previously. An extremely short Third Subsection of Section B in this Part Two (= Chapter VIII) then ties these findings together and summarizes how the six conditions in question empirically verify the particular synchronic rule typology for sound structure whose overall nature and motivation are at issue in these pages. It is then left for the last chapter of the work (= IX; Section C of Part Two) to outline the evolutionary aspect of the typology.
FOOTNOTES FOR CHAPTER IV

1 As mentioned above (in Footnote 3 of Chapter II), the rule typology employed here thus classifies as purely phonological, rather than as phonetic, any non-morpholexical rule of sound structure which neutralizes a distinctive opposition in at least one of its applications—regardless of whether any of the rule’s other applications are neutralizing (as opposed to allophonic). Thus, the typology makes no distinction between rules which are sometimes neutralizing and those which are always neutralizing. Nor, similarly, does it split rules in two if they are only partially neutralizing. It is, after all, imaginable that a rule typology could impose different conditions on the form, ordering, and application of a process depending on whether it is functioning to neutralize underlying oppositions or just to create allophones. Still, no incorrect predictions seem to follow from treating non-morpholexical sound-structural rules in the manner just mentioned—i.e., from classifying them globally as either phonetic or purely phonological.

2 López 1979:238-245 in fact later suggests that there is, after all, a sense in which lexical correspondences can be said to be productive, and she actually reports on a psycholinguistic experiment carried out for the purpose of establishing this. However, I will here continue to maintain López’ general position that lexical-correspondence rules are not productive. Rather, it simply turns out to be possible for a speaker to learn instantiations of an existing lexical correspondence which are not novel to his/her language but are new to him/her. Similarly, it is also possible to induce a speaker to accept extensions of lexical correspondences beyond their pre-
existing stock by convincing him/her that (s)he simply has accidentally missed hearing such forms. In any case, the entire issue of phonological and morphological productivity is indeed a vexed one; for extensive discussion of the latter, see Aronoff 1980 and references there.

3 The historical divergence of cow and beef seems to have proceeded roughly as given on the following page:
"Morphologically conditioned phonological rules" are sometimes called "morphophonemic rules", but this term is better avoided in this context due to its ambiguity, since American structuralist practice has firmly established one usage of "morphophonemic rule" in the sense 'purely phonologically conditioned (phonological) neutralization rule'.
APPENDIX IV

On Interpreting Rule Schemata as Single Rules Rather Than as Sets of Multiple Rules Collapsed with One Another

IV.0.

In Chapter IV, immediately preceding, a synchronic typology for sound-structural processes was presented. In the course of this, it was suggested that the phonetic, phonological, morphological, and lexical-correspondence rule types thereby arrived at are not just arbitrary taxonomic categories. Rather, the distinctness of these types can actually be validated on the basis of the differential patterning which they show with reference to several conditions on the form, ordering, and application of sound-structural rules--as is demonstrated in the following four chapters (= V-VIII). In this connection, it therefore becomes crucial to address the issue of whether processes of sound structure which employ the notational conventions of generative phonology (GP) are in fact really single rules or else groups of rules collapsed together only for purposes of the evaluation metric. That is, when considering any so-called "rule schema", are we ultimately dealing with one rule or with several rules merely abbreviated unitarily for later evaluation by some simplicity metric--or perhaps even just for convenience' sake?

Obviously, the answer which we give to this question will have far-reaching consequences for the nature and amount of evidence that we will be able to bring to bear on the rule typology from the facts of rule form--and particularly from those of rule interaction.1 This is especially the case for Chapters VI and VII below, of which the former concerns so-called "exchange rules" and the latter concerns the so-called "Elsewhere' Condition".
Exchange rules necessarily involve the generative notational convention of Greek letter variables—a situation which of course relates to rule form. However, if each rule schema with alphas, etc. in it represents a group of processes, then dealing with exchange rules will also require taking a stance on issues of rule ordering and application (i.e., conjunctivity vs. disjunctivity). But if exchange rules simply represent single processes, then obviously no questions of internal ordering and application ever arise in connection with them. Regarding the Elsewhere Condition, on the other hand, the matter of whether rule schemata are essentially units or clusters is directly relevant because it clearly affects all of form, ordering, and application. At the very least, a decision that rule schemata are unitary processes materially reduces the number of rules for which we can consider possible conflicts (whether internal or external) and any resultant need for disjunctivity in ordering and application, since such a finding makes the putative sub-rules in any schema unavailable for individual comparison and interaction with other rules.

This Appendix IV discusses four arguments in favor of the conclusion that rule schemata should be—or at least can be—treated as single processes, rather than as mere abbreviations for sets of processes. This conclusion is then assumed in all of the following chapters (most relevantly, in Chapters VI and VII). For the record, though, it should first be made clear that two of the arguments in question were originally proposed by J. McCawley. However, the other two have not previously been suggested in the literature, as far as I am aware.

IV: 1. The Abbreviatory Interpretation of Rule Schemata in SPE—and Mc-
Cawley's Criticisms of That View.

The possibility of there being two different approaches to rule schemata employing the notational conventions of GP is shown by the fact that Chomsky and Halle 1968 are actually somewhat inconsistent in their treatment of such entities. For the most part, SPE presents "notational devices" as "abbreviatory conventions"—hence, as derivative constructs, rather than as elementary or "primitive" ones. Thus, Chomsky and Halle 1968:36, 147, 333-335, 392-393 make it absolutely clear at various points that such abbreviatory conventions are only part of the "evaluation [or "simplicity"] metric" for phonological descriptions, not part of any language's actual set of phonological rules per se. That is, the real, elementary, primitive rules of a grammar include no rule schemata because they contain no such rule-collapsing devices as braces, parentheses, angled brackets, subscripts and superscripts, or Greek letter variables. In fact, for rules stated in their most basic form, SPE:393 even excludes such "auxiliary expressions" as the slashes and bars (or dashes) which usually appear as part of the environments in rules.

Instead, SPE:147, 333, 335, 390, 392 assumes a system where rule schemata containing entities like the those just mentioned are "built up" by applying to the set of primitive rules certain "notational operations" (or "transformations"). On this view, it is actually primitive, convention-free rules—rather than derivative, abbreviated, schematized ones—that actually apply to strings of segments (and would now, by extension, also apply to multilinear representations). That this approach to notational conventions is probably the dominant one in Standard GP (SGP) is shown by its explicit presentation in such theoretical overviews as Anderson 1974c:80-81 and
Kenstowicz and Kisseberth 1979:341-342 (but cf. their own, contrasting approach on pp. 345, 351-352). To repeat, the essence of this SGP view is the idea that one arrives at a set of rule schemata containing abbreviatory devices in two steps. First, one writes a full description of a language's phonology in terms of primitive rules. Then, using the available notational conventions, one collapses together as many of these processes as one can. (Given the evaluative function of the simplicity metric, it is further the case that one is supposed to formulate and order the primitive phonological rules of a grammar in such a way as to maximize their potential for abbreviability in rule schemata.)

Nevertheless, this conception of GP's notational devices has been subjected to continuing criticism by McCawley (especially 1973, but also 1974/1975). The first of his two main arguments against the view that rule schemata are fragmentary clusters of processes has to do with disjunctivity. McCawley finds it suspicious that, except in the case of rules collapsed via braces (whose combined abbreviation can often be attacked on other grounds), the "subrules" abbreviated in rule schemata never interact with one another, since they are always disjunctively ordered. This view is thus diametrically opposed to the position taken by Chomsky 1967/1972 and \textit{SPE}:36, in whose opinion the limitation of the need for disjunctive ordering to subrules of schemata without braces is striking confirmation for the validity of notational devices originally proposed in order to serve as part of the evaluation metric. That is, McCawley sees the identical limitation as a strike against those same conventions. For one thing, if co-subrules in a schema never apply conjunctively and so can never interact with one another, there is just that much less possible evidence that they really do belong together.
And, for another thing, if it weren't for the interpretation of rule schemata as abbreviations for sets of elementary subrules, phonological theory might not have to stipulate disjunctive ordering as a basic notion tied in with such conventions.

Furthermore, Anderson 1969b/1971---followed by other scholars---has pointed out that disjunctive ordering can also be imposed on phonological rules via reference to the briefly abovementioned Elsewhere Condition (which will here receive a detailed discussion in Chapter VII below). Indeed, that constraint is able correctly to impose disjunctivity even in certain cases where the rules at issue cannot be collapsed by any existing notational devices. But this then suggests that notational conventions may be irrelevant to the determination of disjunctive ordering, so that they receive no support from their interaction with the latter phenomenon, in any case.

McCawley employs a more direct attack in his second argument against viewing GP's notational conventions as secondary mechanisms that collapse primitive rules into schemata. According to McCawley 1973: 52, 55, GP's "so-called 'abbreviatory conventions' are not 'abbreviatory'...[---] i.e. they do not really 'define' a composite rule as a sequence of other rules"--because "the rules they supposedly abbreviate are often not 'possible rules'".

For example, McCawley 1973:55 observes that a nasal assimilation rule like that in (1) below abbreviates four subrules which each assimilate a nasal to a specific place of articulation, one of these subrules being the process given in (2) further below:

\[
\text{[\text{+nasal}] \rightarrow \left[ \frac{\text{C}}{\text{\text{\text{\text{ant}}}}} \right] / \left[ \frac{\text{C}}{\text{\text{\text{\text{ant}}}}} \right]}
\]
(2) $[+\text{nasal}] \rightarrow \frac{[+\text{anterior}]}{-\text{coronal}} / \frac{C}{-\text{coronal}}$

However, while the general nasal assimilation rule in (1) above is cross-linguistically common, McCawley 1973:44 suggests that (2) is not a possible individual rule of a human language (although it is a possible effect of a rule): "...[N]o language has a rule assimilating nasals to the place of articulation of labials and only labials." Rather, such an effect seems always to be achieved as part of the operation of a more general rule. (A similar argument is also presented by Kenstowicz and Kisseberth 1979:251.)

Considerations like that just given lead McCawley 1974:52/1975:148 (following a much earlier proposal in McCawley 1965/1968) to entertain an alternative approach--namely, to "treat rules with [notational devices like] parentheses [in them] as not being abbreviations of anything and [thus] to define ... [such devices] in terms of principles for matching the symbols in ... [a] rule to the parts of ... [an] utterance to which it is applied." (Again, virtually the same suggestion is made by Kenstowicz and Kisseberth 1979:345, 351-352--who do not, however, mention McCawley in this context.)

IV.2. Additional Reasons to Treat Rule Schemata as Unitary Processes

Rather than as Fragmented Clusters of Processes.

An additional, third justification for preferring the unit interpretation over the cluster view of rule schemata in GP concerns the fact that the usual practice in generative syntax has always been to treat its similar rule schemata as unitary, primitive rules, rather than as abbreviations. This is especially non-controversial because it is almost universally accepted that there is no principled limit on the length of sentences in natural languages--at
least as far as linguistic competence is concerned. Given that there is a literal infinity of lengths for sentences and also for many types of phrases, it is clear that the phrase-structural and transformational rule schemata which account for such structures cannot be arrived at by first formulating all of the primitive syntactic subrules that are relevant--without the use of any abbreviatory devices--and only then using notational conventions to collapse them together.

Rather, the rule schemata of generative syntax must be conceded to have some logical and theoretical primacy over their individual subrules--even if one takes the view that the former are "expanded" as the latter (on this latter point, see also below). Furthermore, it is arguably the case that, ceteris paribus, a linguistic theory which has a uniform interpretation for the same notational devices in both syntax and phonology is preferable to a theory which interprets identical notations differently in those two domains. Since we know that the notational devices of generative syntax are not really abbreviatory and that the rule schemata in which those devices appear are therefore unitary primitive rules, we must prefer an interpretation where rule schemata employing notational conventions are unitary and primitive processes in GP, as well.

A fourth and final argument leading to the conclusion that the rule schemata of GP are both basic and unitary processes can be established partly by proceeding from the fact that Chomsky and Halle 1968 themselves actually also appear to adopt this approach implicitly at various points in SPE. For one thing, they frequently switch from describing the constructs in question as "abbreviations of" their subrules and instead say that rule schemata "expand as" their subrules (cf. SPE:31-33, 36, 61-62, 333-334, 390-393).
In one sense, this is not an inconsistency, since it is only the notion of "expansion" that defines which subrules of a phonological rule schema are disjunctively ordered with respect to one another. That is, since there is some upper bound on the length of non-compound words in many—if not most—languages, it is indeed true that rule schemata in phonology can be constructed by using the available notational conventions to abbreviate the set of elementary, primitive rules in a grammar. And it is also true that the fact of successful abbreviation allows a concomitant determination of the longest subrule (= expansion) out of a set of processes collapsed together. This longest subrule may then apply first, disjoining the operation of any further subrules.

Interestingly, though, this conclusion still implies that the ordering (i.e., the sequence of application) within a set of uncollapsed, elementary rules is itself a primitive, in GP, since only certain orders allow collapsing via the notational conventions. More important, however, is the fact that, in SGP, disjunctivity of ordering is neither represented nor representable among the set of elementary rules—there simply is no notation or mechanism available for it at that "level". Thus, disjunctivity of ordering cannot be a primitive notion of phonology; it can be indicated only after collapsing has taken place, when rules have been combined into schemata.

In this way, it is clear that, on the SPE approach, disjunctive relations of ordering and application within groups of elementary rules can be reckoned (or at least validated) only after such rules have been collapsed together into schemata—as if disjunctivity among abbreviated subrules is determined and achieved via their expansion back into the original ordered set of primitive rules. It is in this sense that SPE's notational conventions really serve
both to abbreviate and to expand groups of subrules. Along these lines, Chomsky and Halle's 1968:394-399 final, axiomatic formalization of the nature, interpretation, and operation of the notation employed in SGP focuses largely on a set of "expansion conventions". Those authors' final suggestion seems to be that, rather than actually first abbreviating primitive rules into schemata and then expanding them again, one should determine the simplest schema for a set of such rules just by finding the shortest schema whose expansions match the original group. While this may at first sound like a case of notational variance, the considerations at issue here in fact turn out to suggest strongly that rule schemata with notational devices in them are primitive units of GP theory, rather than derivative clusters of processes.

For example, if disjunctivity can be determined from schemata, but not from a set of primitive rules alone, while absolute order (= sequencing) can be determined from both, then rule schemata would seem to have a certain logical primacy over their subrules--and so, in a sense, to be theoretically primitive, themselves. Furthermore, Chomsky and Halle 1968:351 on one occasion reveal an unmistakable preference for interpreting rule schemata containing notational devices as primitives of phonological theory. The relevant instance arises out of a discussion earlier in SPE regarding one issue in the phonology of the Amerindian language Southern Paiute.

In order to express the fact that Southern Paiute consonants assimilate in place of articulation to a following consonant, Chomsky and Halle 1968: 346 propose the following rule:
(3) \[
\begin{array}{l}
\alpha \text{anterior} \\
\beta \text{coronal} \\
\gamma \text{back} \\
\delta \text{high}
\end{array}
\rightarrow
\begin{array}{l}
\alpha \text{anterior} \\
\beta \text{coronal} \\
\gamma \text{back} \\
\delta \text{high}
\end{array}
\]

Now, Southern Paiute has consonants only at the labial, dental, and velar places of articulation, and it is true that three of the subrules corresponding to the rule schema in (3) above account, respectively, for assimilation of consonants in the language to following consonants at those places of articulation. However, Chomsky and Halle observe that three other subrules corresponding to the rule schema in question describe assimilation of consonants to following consonants that are palatal, palatalized labial, and velarized dental, respectively—even though Southern Paiute has no such segments (at least phonologically). Thus, no segment and hence no form in the language can undergo any of these other subrules. In short, some special cases of the rule schema in (3) are totally vacuous—they never apply.

Chomsky and Halle 1968:346 note the existence of this phenomenon and, by way of reaction, comment on it as follows: "There is no point in complicating the [Southern Paiute consonant assimilation] rule in order to prevent ... [the set of vacuous subrules abbreviated by it] from applying...[, because] the situation in which it applies can never arise. More precisely, our formalism implies that the [entire] sequence of [sub]rules[--including the vacuous ones--]...is simpler, in the technical sense, than the limited sequence [consisting of just the set of non-vacuous subrules] itself .... ...[S]ince there is no empirical reason to reject the more highly valued [full] sequence [including both vacuous and non-vacuous subrules], we are required to accept it as part of the grammar... [of Southern Paiute]."

A number of inferences can be drawn from these remarks. But the
clearest such inference is that, for obvious reasons, the above statements are completely incompatible with an approach to phonology that arrives at rule schemata containing notational devices by first formulating and ordering all the actual, non-vacuous subrules of a language and only then collapsing them together via abbreviatory conventions. Rather, Chomsky and Halle here seem to be presupposing a principle that, on the one hand, the rule schemata of a language must expand into at least all of its primitive rules, but, on the other hand, instances where a rule schema expands into vacuous subrules are not to be evaluated as defects of an analysis. Indeed, such cases are even to be regarded as virtues of an analysis as long as they maximize rule schematization. Given this, it hardly seems possible to view rule schemata with notational devices in them as derivative—as anything but primitive. Otherwise, we must say, not only that Southern Paiute really has several vacuous primitive rules corresponding to (3) alone, but also undoubtedly that it has such rules for other schemata as well—and certainly that vast numbers of primitive rules in numerous other languages are vacuous. Such a conclusion would surely be both unenlightening and undesirable.

On the basis of considerations like those just given, it must be concluded that the descriptive practice of Chomsky and Halle 1968 is actually to treat rule schemata containing notational devices as unitary primitives, even if their theoretical discussions suggest that such constructs are secondary and derivative. Thus, although the rule schemata in SPE are analyzable as expanding into various subrules, it is still the case that subrules which never are able to apply—and/or, presumably, ones which can be allowed to apply without any untoward results—are essentially just to be ignored. As long
long as they don't create ungrammatical ("unphonological") strings, it seems, vacuous and/or innocuous subrules may be tolerated among the various expansions of a rule schema. And a situation of this sort makes sense only if rule schemata have some kind of logical and theoretical primacy over the subrules which they define and into which they expand.

It should be emphasized, though, that Chomsky and Halle's implicit recognition of rule schemata with notational devices in them as primitive, unitary processes still represents a different perspective from the views of McCawley 1965/1968, 1973, 1974/1975 (some of which were quoted above). This is because, even on the tacit SPE approach--the one treating notational conventions as instructions for expansion rather than for abbreviation--the processes that actually apply to phonological representations are expanded subrules, not the schemata themselves. That is, the only discernible conceptualization of rule application in SPE seems to be one where rule schemata do not directly operate on forms but must instead first be expanded into their subrules before they can indirectly do so.

I interpret McCawley's view, however, to be that putative rule schemata are in some sense not really schemata at all, but just simple, single, primitive rules that differ from other processes only in that they happen to contain notational devices. Hence, rule schemata do not need to be expanded into a set of subrules before they can apply, as in SPE--since for McCawley they do not really represent more or less just a set of instructions concerning how to create a set of other rules, as they do for Chomsky and Halle 1968. Rather, on this presumptively McCawleyan approach, rule schemata themselves apply directly to phonological forms. (Even if the approach just characterized should turn out not to be the one that McCawley had/has in mind,
it is nevertheless the one which I wish to adopt here.)

Concomitantly, the notational devices employed in rule schemata can then be interpreted as embodying various kinds of conditions, or conditional operations--perhaps even ones often involving "nested" conditionals. Abstract instances of such (an interpretation of) rule schemata would be process types like "If a form has property X or property Y, then perform change C on it", or "Perform change D on a form regardless of whether or not it has property W, just as long as it has property Z", etc. Indeed, conditions phrased in this way usually figure--at least informally--in most discussions of rules in the GP literature. That is, braces represent alternatives; parentheses, subscripts, and superscripts represent continuous options, as if they were, and angled brackets represent discontinuous options. Greek letter variables, on the other hand, simply represent agreement (or, when "-" is involved, disagreement) in feature values. Finally, alternative orders of elements are given via the mirror image notation now usually marked by "%" (discussed at length in the following chapter, V).

On this view, there obviously arise no problems with vacuous subrules. Furthermore, in many cases, the issue of disjunctive ordering within rule schemata does not even really ever come up, since each rule with at least one notational device in it is a single entity, rather than an abbreviation for a set of subrules (whether already collapsed or still to be expanded). (For other cases where, however, disjunctivity is still an issue, see below.) Obviously, much more fleshing out of details is needed before it can count as conclusively established that rule schemata containing notational devices are best interpreted as unitary, primitive processes which simply happen to involve various conditions. Still, I believe that sufficient grounds have been
given here (partly following McCawley) in order to conclude that this approach is not only plausible but also already advantageous in a number of respects—and that it promises to yield additional benefits if pursued further.


In the remainder of this Appendix IV, I briefly consider some such further aspects which are likely to be central in later research exploring the assumption that the notational devices of GP are not really abbreviatory (or even expansive) and that rule schemata are therefore primitive unit processes of grammar.

One question which has occasionally been raised in this regard (although not, to my knowledge, in print) concerns vacuous subrules. Namely, it is sometimes suggested that rule schemata interpreted as non-unitary derivative abbreviations should be evaluated positively, not negatively, when they involve vacuous subrules like those discussed above vis-à-vis SPE’s treatment of consonant assimilation in Southern Paiute. The reasoning offered here is that it is good to have such vacuous subrules involved because they yield a prediction concerning what would happen if new segments were added to a language. This consideration is surely relevant, but it does nothing to favor a non-unitary interpretation of rule schemata over a unitary one, since the latter approach also yields predictions about whether future segments would undergo a particular rule (schema) or not.

This issue can perhaps be clarified by adducing an analogy from the related domain of feature notation in GP. If the input to a rule is indicated solely by the notation " [+nasal]", no one would think of saying that the proc-
ess in question is therefore a rule schema which abbreviates a subrule for every different nasal segment to which the process applies (or could apply). Rather, as far as its input is concerned, the rule is simply a unitary process that applies to any segment which bears the feature (value) [+nasal]--and which is, further, situated in an appropriate environment. But precisely this unproblematic and uncontroversial interpretation can be given for a treatment which evaluates rule schemata containing notational devices as unitary primitive processes. Rule schemata qua units lacking vacuous subrules are therefore exactly as predictive as rule schemata qua abbreviations involving such vacuous expansions.

A more substantive issue concerns situations where it appears that two or more interpretations (= expansions, in older terms) of a rule schema can apply to the same part of a linguistic form. In the instance of rule schemata employing braces, the effect of conjunctive ordering is necessary in such interactive cases. McCawley 1974/1975 has suggested that this effect can be achieved even with an interpretation of rule schemata as unitary primitives, although much work remains to be done in perfecting his solution. I have nothing further to add to McCawley's proposals, so I will here simply refer the reader to McCawley 1974:52/1975:148-149. McCawley does not, however, say much about cases where more than one interpretation (expansion) of a rule schema--i.e., more than one subrule--could apply to the same part of a form. The problem here, of course, involves how best to ensure that only the longest interpretation/expansion/subrule applies. For example, disjunctivity imposed by the Elsewhere Condition cannot be used to replace the disjunctivity formerly invoked by notational devices qua abbreviatory conventions. This is because the former mechanism requires pairs of
conflicting rules (or subrules) no less than does the latter, whereas obviously only a single rule is involved if rule schemata are interpreted as unitary primitives.

It might be possible to reinterpret or redefine the Elsewhere Condition in such a way that it can be invoked in the cases currently at issue. However, there are two further considerations which apparently obviate any need for a move of this sort. First of all, there is the fact that the vast majority of sound-structural phenomena formerly thought to require notationally imposed disjunctivity of rule application within rule schemata have been reinterpreted within recent multilinear approaches to phonology and morphology in such a way that disjunctivity is no longer required. This is especially true of the many stress rules which have now been reanalyzed within Metrica l Phonology (for relevant references, see Appendix II above). There is thus a clear need for a new survey of the GP literature enumerating and summarizing all those currently valid rule schemata which have multiple subrules that could apply to the same part of a single form. I obviously cannot undertake and/or present such a survey here, but suffice it to say that the relevant instances cannot be numerous, since non-stress rules requiring disjunctive order within rule schemata were never common even in SGP, anyway.

Even if rule schemata of the type just described were numerous, though, a second relevant consideration can be brought in which concerns the possibility of achieving effective disjunctivity even with simultaneous application of subrules. In this regard, it should be emphasized that the present interpretation of rule schemata as unitary processes does imply that subrules apply to a form simultaneously in cases where more than one interpretation
of the same form is possible for those subrules. As just mentioned above, it is the case that, in most—if not all—instances, such simultaneously applying subrules do not now conflict. But, even in situations where they do conflict, it is possible to invoke an already independently motivated constraint governing conflicts among simultaneously applying rules.

This constraint concerns the "Revised Simultaneous Theory" of rule application presented in Anderson 1974c and later discussed by him and others (cf. the references in Anderson 1979a). In essence, this constraint prohibits the application of a rule which would destroy part of the required environment for another, simultaneously applying rule. In instances of conflict among subrules of a rule schema, though, it is precisely the case that all the shorter interpretations/expansions conflict with the environment of the longest one (but not vice versa), and so the "Revised Simultaneous Theory" would seem to make exactly the right predictions here. Once again, more work is needed in order to flesh out this proposal before it can be accepted as established. Still, it offers great promise for making questions of disjunctivity unproblematic for an approach where rule schemata are interpreted as unitary processes.

A third and final issue which arises in connection with the reinterpretation of rule schemata as unitary primitive processes has to do with differential exceptionality across subrules. That is, it is a common practice in GP to assume that two rules which have different exceptions should not be collapsed together, even if they share formal similarities (cf., e.g., Zwicky 1970b). However, Anderson 1974c:85-87 explicitly suggests that formally similar rules with different exceptions may be collapsed together as long as they are still distinguishable as separate subrules within a rule schema.
The question then arises of how such differential exceptionality is to be dealt with if rule schemata are treated as unitary processes. At first glance, it does not appear that, on the latter approach, differentially exceptionable rules could ever be collapsed. And, of course, one could justify this situation by invoking the more common approach (of the two mentioned above) which treats similar rules with different exceptions as separate processes that are only accidentally similar. Still, there is at least one possibility for separating such rules without a need to claim that their similarities are accidental. At issue here is an extension that can be made into phonology (and possibly phonetics) from current morphology.

In recent work on word formation, a number of writers (e.g., Janda 1982b, Schmerling 1983b, Hoeksema and Janda 1985, Janda and Joseph 1985/1986, Anderson 1986, and Joseph and Janda 1986) have focused on the recurrent formal similarities which exist across morphological rules (or morphemes, in a more traditional sense) in numerous languages. Given the commonness of this phenomenon, the writers in question have argued that these shared similarities in form are not accidental and should therefore be expressed in a grammar. This, they propose to do by recognizing such recurrent formal elements as grammatical units (= rules or morphemes) in their own right—albeit ones with little, if any, semantic content. Thus, in addition to the three English inflectional morphemes noun-phrasal -'s 'possessive', nominal -s 'plural', and verbal -s 'third person singular present indicative', we can recognize a relatively asemous English grammatical element -s. Or, alternatively, we can posit a kind of morphological meta-redundancy-rule (or redundancy metarule) which expresses the unity amidst diversity which is arguably present here.
Once such metarules defined over separate rules have been admitted into sound structure in the domain of morphology, though, there is no reason why they cannot also be adopted in phonology (proper)--and perhaps even in phonetics (cf. the last section of Chapter IV above). Hence, at least in phonology, formally similar rules with different exceptions can be constituted as separate processes, but their non-accidental similarities can also be expressed by a phonological meta-redundancy rule (or redundancy metarule). Here, we need to add only a slight modification of a further constraint argued for by Anderson 1979a--namely, that formal similarities across subrules justify collapsing them together only when there are also shared similarities of phonetic function. The latter condition also seems like an appropriate one to place on phonological meta-redundancy rules. With a properly constrained set of such rules, we can apparently have our cake and eat it, too, in regard to keeping processes with different exceptions separate while still expressing formal (and functional) similarities across them. Yet once more, however, this suggestion needs to be tested by extensive future application to specific phenomena.

This last conclusion in fact typifies this entire Appendix IV: we have arrived at a solid core of both old and at least partially new arguments in favor of a certain general proposal whose further specifics remain to be determined in the course of their continuing application to particular problems. Thus, in the rest of this work, it will be assumed that rule schemata containing the notational devices of GP are unitary primitive rules, rather than derivative abbreviations for sets of rules. But the consequences of this assumption will be seen most clearly in several contexts below. Thus, for example, mirror image rule schemata figure prominently in part of Chapter
V (immediately following), while Greek letter variables play a crucial role in Chapter VI, which concerns exchange rules. And the unification of rule schemata attempted here has a dramatically perceptible effect on the amount of evidence available to support the Elsewhere Condition within various domains of sound structure, as subsequently discussed in Chapter VII.
FOOTNOTES FOR APPENDIX IV

1 The importance of a similar kind of issue is in fact recognized by Chomsky and Halle 1968:434-435 themselves--on the very last two pages of the main text of SPE. In discussing the application of markedness conventions and linking rules to (a reformulation of) the English Vowel Shift Rule, Chomsky and Halle observe that "both parts of the Vowel Shift Rule are schemata which abbreviate two rules each.... This is important for the correct application of [the principle that "A linking rule applies either to all or to none of the segments formed by a given rule"--]principle (49) [(SPE: 431)--] since that principle refers to rules and not to schemata....

"As R[ichard] Stanley has pointed out to us, in view of principle (49)[,] the decision as to whether or not [the markedness convention that it is unmarked for non-low vowels to agree in rounding and backness--][[6.XIa) [(SPE:405)--]applies here depends on whether schemata are treated as single conventions or as abbreviations of several individual conventions. If the former decision is made, then convention (Xla) will apply in the case under discussion... [= part (b) of the Vowel Shift Rule]; "its effects would be vacuous, however"]]. If, on the other hand, the latter decision is made, principle (49) will block the application of (Xla). Since the same consequences follow from either decision in the present instance, it is impossible to know which choice is correct. The issues involved, however, are clear."
Second Subsection
Six Proposed Conditions on the Form, Ordering, and Application of Rule Types
[= Chapters V-VIII]

First Subpart
[= Chapter V]
CHAPTER V
A Constraint on Syllable-Totaling Rules; The Weaker Crossover Condition; The Alternation Condition, and A Constraint on Mirror Image Rules

5.0.

This chapter shows that initial independent motivation for the sound-structural rule typology laid out in Chapter IV immediately preceding is currently available from the differential application to the phonetic, phonological, and morpholexical rule types of four restrictions—all previously discussed in the generative-phonological literature—which govern the form, application, and ordering of rules in sound structure. Indeed, it is only the recognition of the relevant sound-structural types by grammatical theory—via their definition according to the formal properties here detailed previously—which allows the relevant constraints to be imposed. Otherwise—if sound structure were an undifferentiated mass of rules (including, e.g., "morphologically conditioned phonological rules")—the demonstrable correlation of various formal, applicational, and ordering properties of sound-structural rules with certain other of their formal properties would be a totally inexplicable accident.

The four limitations on sound structure treated in this chapter have all been under discussion for a number of years—some for nearly twenty. Yet it is essentially correct to say that their relevance to a rule typology has been emphasized only in the works of Anderson (cf. Anderson and Browne 1973, Anderson 1974a, 1974c, 1975, 1979a), and even these writings all date from the past decade. In a sense, we can readily understand how the cur-
rent relative neglect of a task like distinguishing between, e.g., phonological and morphological processes has resulted from the recent generative fascination with exploring the possibilities and limitations of Multilinear-Phonology (cf. the references here in Appendix II above).

This approach--particularly its Autosegmental-Phonological aspect--of course recommends itself for both morphology and phonology (the latter now being located, as in "Lexical Morphology and Phonology", not only inside but also outside the lexicon), and it also in fact highlights the similarities between those domains. Nevertheless, the considerations adduced here previously (especially in Chapters I and II) suffice to demonstrate that no true progress in phonology or morphology can ultimately be achieved until those two domains are constrained vis-à-vis not only each other but also phonetics and the sound-related aspects of underlying lexical representations. As a start, the present chapter of this work therefore reassesses proposed type-distinguishing constraints on rules dating from the 1970's or earlier.

First, in the case of the constraint on "syllable-totaling" rules originally suggested by Hankamer 1973 and first correlated with a sound-structural typology by Anderson 1974a:2, 1975:42, it turns out that Hankamer's original supporting evidence for his claim that only morpholexical rules can refer to the total number of syllables in a word must be reevaluated as follows. Hankamer's six valid instances of morpholexical syllable-totaling rules (and one additional instance pointed out by Pullum and Zwicky [no date]) can here now be supplemented with fully twenty-two new such examples, although two of Hankamer's putative cases turn out to invalid. On the other hand, six alleged phonological syllable-totaling rules which have been pro-
posed since 1973 can now be shown to be actually not syllable-totaling, after all, given the availability of Multilinear-Phonological analysis (especially Metrical Phonology).

Second, in the case of the "Crossover"(-type) Conditions of Howard 1972a/1972b/1972c and his contemporaries—which were originally intended to impose strong restrictions on the material which can separate the "targets" and "triggers" of phonological (and, by extension, phonetic) rules but were later argued by Anderson and Browne 1973 and Anderson 1974a: 2, 1975:42, 1979a:12-13 not to govern morpholexical rules—the present chapter can cite only one additional morpholexical process from the literature which validates the limitation of Howard's "Weaker Crossover Condition" to the phonetic and phonological rule-types, but it also clarifies the bearing of recent Multilinear-Phonological work on that constraint—especially the possibility of eliminating the violations of it previously argued to result from the presence of "neutral" vowels in certain phonological harmony-systems.

Third, in the case of the "Alternation Condition" and its successors (as discussed especially in a string of works by Kiparsky starting in 1968), the proposal by Anderson 1974a:2, 1975:42 that such a constraint must be specifically defined so as not to govern phonetic rules is maintained and defended by this chapter, even in the light of recent proposals within Lexical Morphology and Phonology that the Alternation Condition must be replaced with some form of the/an "Elsewhere Condition" which does not exempt phonetic rules alone but in fact exempts all postlexical rules, including phonological ones of absolute neutralization. It is here concluded, however, that processes of the latter sort should be prohibited, after all, and that the/
an Alternation Condition which exempts only phonetic rules is therefore specifically required in order to enforce such a prohibition—which does not follow from the Elsewhere Condition (despite all the independent motivation which justifies our positing it, too, as a condition on sound structure—cf. the more detailed discussion here in Chapter VII below). My conclusions here thus differ radically from Anderson’s 1980c:76-83/1981a:529-535 complete reversal of his earlier (1974a, 1975) position regarding the existence of the Alternation Condition and hence its possible relevance for phonetic rules.

Fourth and finally, in the case of the constraint on mirror image rules effectively proposed by Anderson and Browne 1973:462-463 and Anderson 1974a:2, 1974c:iv, 1975:41—with the effect of requiring the subrules in all non-phonetic mirror-image schemata to apply disjunctively, rather than conjunctively—the present chapter concludes, on the one hand, that there are no valid examples of purely phonological mirror-image rules whose parts must apply disjunctively and that therefore not only phonetic but also phonological mirror-image rules apply simultaneously, as single processes, rather than sequentially, as sets of subrules. This is, moreover, exactly what would be expected on the basis of the proposals made here above in Appendix IV regarding the non-schematic interpretation of all rules employing notational devices. On the other hand, such conclusions do not entail the loss of a type-validating constraint on sound structure, since they presuppose different modes of application—namely, cumulative (= additive and/or subtractive) vs. replacive—for rules of phonetic (or at least phonetic-detail) vs. non-phonetic type, respectively. Given that the main manifestation of this difference is found in mirror image rules, though, we can continue to refer to a "constraint on mirror image rules" which sets phonetic processes

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off from those of all other types.


V.1.0.

As a first property of grammar that clusters together with the parts of the synchronic rule typology presented in the last chapter (IV), we can consider the constraint on "syllable-counting rules"--or (to give it a more accurate characterization) on "syllable-totaling rules"--originally proposed by Hankamer 1973 and later discussed by Anderson 1974a:2, 1975:42 and Pullum and Zwicky [no date]-MS.§3.1.1. Presently available evidence indicates that any rule which affects forms differently depending on how many syllables they contain is always a morpholexical (i.e., morphological or lexical-correspondence) rule, never a phonetic or purely phonological process. Rather, rules of the latter two types which superficially seem to total syllables apparently are always actually dependent on the presence/location of stress or on some other such parameter.

V.1.1. Previous Work on Syllable-Totaling Rules in Generative Phonology (GP).

As illustrations of morpholexical "syllable-counting" rules, Hankamer 1973 provided eight examples (two from one language), of which six can still be maintained as valid. For example, Hankamer mentions the well-known regularity governing the distribution of more vs. -er for the English comparative, where--roughly--the suffix -er occurs with monosyllabic and bisyllabic adjectives, while more occurs with trisyllabic and longer adjec-
tives.

A second such case comes from Turkish, where the general-tense (or "aorist") suffix has--with only a handful of (= 13) exceptions--the form -AR after monosyllabic stems, but -IR after polysyllabic stems (archiphonemically). Following Pullum and Zwicky [no date]-MS:§3.1.1.1 (based on Lewis 1967:115-117 and Underwood 1976:145-147), though, the relevant generalization actually turns out to be that only monosyllabic stems which are also monomorphemic show the -AR suffix for the Turkish general tense. That is, not only polysyllabic stems but also polymorphemic monosyllabic stems are suffixed with -IR for the relevant category. As examples, consider the following. The stems at- 'throw (away)', tut- 'hold', de- 'say', gid- 'go (away)', and sev- 'love' have the respective general-tense forms at-ar, tut-ar, de-[y]er, gid-er, sev-er. But the stems de-+ -n 'passive' = de-n- 'be said', gid- -IL 'impersonal' = gid-il, otur- 'sit', and sev-+ -I§ 'reciprocal' + tIR- 'causative' + -IL = sev-i§-tir-il 'cause to love one another; caress one another' have the respective general-tense forms de-n-ir, gid-il-ir, otur-ur, sev-i§-tir-il-ir.

Hankamer's third example of a syllable-totaling rule comes from Mohawk, as analyzed by Postal 1968:116-117 (cf. also Michelson 1977). At least six verbal prefixes (for first person, second person, inclusive person, masculine, feminine, and zoic categories) have two sets of allomorphs--both with and without prothetic i-. The i-ful allomorphs occur only before monosyllabic verbs; the non-prothetic allomorphs, only before polysyllabic verbs. Clearly, Mohawk has a rule of i- prothesis. Since this process is triggered only before certain prefixes on monosyllabic verbs--and not, e.g., before monosyllabic nouns--it must, in terms of the present rule typology, be
characterized as a morphological rule. In combination with other rules of Mohawk, i- prothesis applies to turn underlying /s+ek+s/ 'you (one) eat it' into phonetic [i:zek:s], but it does not affect /s+ni+kλ+s/ 'you (two) see her', which (via other rules) ultimately becomes [ze:ni:ɡas].

As emphasized by Pullum and Zwicky [no date]-MS:§3.1.1.2, it is significant that at least one phonological rule of Mohawk--the truncation rule \( V \rightarrow \emptyset/V \) --precedes i- prothesis. Here, again, a morphological rule must follow a purely phonological one. Thus, e.g., /s+ni+ek+s/ 'you (two) eat it' is not underlying monosyllabic and so must undergo truncation to /s+ni+ek+s/ before it can receive an initial i- by prothesis and eventually become [i:zen:ek:s]. Notice, also, that this last form shows how later epenthesis rules may apply in such a way that verbs which undergo prothesis because they are monosyllabic at an intermediate stage of derivation may later become polysyllabic (even aside from i-) on the surface.

As an aside, it can be mentioned at this point that Pullum and Zwicky [no date]-MS:loc.cit. show the staying power of the notion "morphologically conditioned phonological rule" (= a type of entity which the present work is expressly concerned to prohibit) when they suggest that Mohawk verb prothesis is an "ordinary phonological rule ... sensitive to both syntactic category and number of syllables ... at a non-initial point in ... [a] derivation." The current section here, however, verifies that there are absolutely no independently motivated examples of purely phonological syllable-totaling rules. Consequently, we have every reason to consider Mohawk verbal prothesis a morphological rule, and we also have support for the position of the present rule-typology that any process crucially mentioning a morphological feature--even a general morphosyntactic one like [+Verb]--must count as a
morphological rule, rather than as a purely phonological one.

(I should also mention at this juncture, though, that Pullum and Zwicky [no date]-MS represents only those authors' initial thoughts, privately circulated in draft form, as of more than five years ago. It would thus be unfair to cite that work as if it represented their current tentative positions or even their firm convictions at some time in the past. I will therefore henceforth refer here to Pullum and Zwicky's [no date]-MS book draft "The Syntax-Phonology Interface" by means of the abbreviation "TSPI".)

A fourth example given by Hankamer 1973 as a syllable-totaling morphological rule concerns Dyirbal, as analyzed by Dixon 1972:42. For vowel-final nouns, the category 'ergative' is realized as -ŋu after bisyllabic stems but as -gu after stems that are trisyllabic or longer. (Dyirbal has no monosyllabic stems.) Thus, yara 'man' has the ergative form yaraŋgu, but yaman 'rainbow' in the ergative is yamangu. Although Hankamer 1973 and "TSPI":§3.1.1.3 apparently overlook this point, Dixon 1972:42 also recognizes a separate nominal-case category of instrumental which is formally "identical with the ergative" and therefore is realized by rules showing the same syllable-totaling behavior. According to Dixon (loc.cit.), "there are strong syntactic reasons for distinguishing [the] two cases" (cf. also Dixon 1972:93-95). If this distinction is accepted, the number of syllable-totaling rules found in languages cited by Hankamer 1973 (and also "TSPI") obviously increases by one.

Hankamer's 1973 fifth valid example of a morphological syllable-totaling rule comes from Maori (cf. "TSPI":§3.1.1.4). According to Hohepa 1967:19, 21, the imperative-marking /ee/ affix of Maori is prefixed to monosyllabic and bisyllabic verbs, while verbs which are trisyllabic or longer are
not overtly marked for the imperative. Thus, constrast /ee tuu/ 'arise!',
/ee kai/ 'eat!', and /ee noho/ 'sit down!' with /haere/ 'go!', /maraqa/
'stand!', /patu-a/ 'hit/kill (him)! and /faka-o ma-tia/ 'make it run!'.

Hankamer's 1973 sixth and final valid example of a morphological syllable-totaling rule concerns Pukapukan. There, it is claimed, the vowels of
the case markers i and e lengthen to I and e, respectively, before mono-
syllabic and bisyllabic stems. Before stems that are trisyllabic or longer,
though, i and e remain short. Hankamer provides no representative exam-
pies for this Pukapukan situation, (nor does "TSPI", which accepts his anal-
ysis), and there are apparently no illustrations of it to be found in Chung
1978. Still, I know of no reason to doubt Hankamer's claims about Pukapu-
kan, and so I will here accept that language's case-marker-lengthening rule
as a bona fide syllable-totaling process of morphology.

In addition to Hankamer's 1973 six examples, "TSPI":§3.1.1.3 provides an additonal seventh case of a morphological syllable-totaling rule by reff-
ring to Dixon's 1972:10 characterization of the Walmatjari ergative marker.
For vowel-final nouns, this category of Walmatjari grammar is realized as
-ŋu on bisyllabic stems and -Ju on stems which are trisyllabic or longer.
Again, there are apparently no monosyllabic stems in the language (cf. also
Dixon 1972:3, 1980:127). Dixon 1972 provides no words illustrating the al-
ternation in question here, but Dixon 1980:501 lists references to Hudson

To the best of my knowledge, the seven abovementioned instances
from English, Turkish, Mohawk, Dyirbal, Maori, Pukapukan, and Walmatjari
discussed by Hankamer 1973 and "TSPI":§3.1.1.3 represent the only mor-
phological syllable-totaling rules collected by surveys of such phenomena

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in the literature of Generative Phonology (GP) before the present work.

V.1.2. Strengthening the Case for the Necessary Morpholexicality of Syllable-Totaling Rules in Sound Structure.

There are three principal logically possible ways in which one can reinforce the validity of a proposed grammatical constraint: (1) by finding additional cases that obey the constraint, (2) by locating and then discarding previously suggested cases that have been alleged to support the constraint but are in fact invalid, and (3) by refuting proposed counterexamples to the constraint. As it turns out, the morpholexical constraint on syllable-totaling rules first proposed by Hankamer and later affirmed by Anderson 1975 can be strengthened in all three of these ways. I will discuss the relevant issues in order, beginning with additional valid cases of morphological processes that are syllable-totaling.

"TSPI".§3.1.1.3 suggests that "...[a]llomorphy along ...[syllable-totaling] lines is apparently quite common in Australia languages", and it is quite right about this. Several further instances can be added to the Dyirbal and Walmatjari examples mentioned in the preceding section. First, it was, for example, already pointed out in the preceding section that the Dyirbal instrumental-case ending for nouns shows the same variation in shape as does the ergative vis-à-vis the number of syllables in a stem. Second, Dixon 1972:10 (following Klokeid 1969:25) reports that, in Thargari, the ergative inflection is -gu after bisyllabic stems ending in a vowel, but -du ("with assimilation, etc.") after all other stems. Third, fourth, and fifth, in Kalkatungu, "...[l]ocative type-a has the form -di on a trisyllabic stem ending in a vowel and -biya on all other stems... [It can be translated 'at', 'in' or
'on']") (cf. Dixon 1980:304), while the ergative ending for vowel-final nouns is -ŋgu after a bisyllabic stem but -dhù after trisyllabic or longer stems (cf. Dixon 1972:9, after Blake 1969:33, and Dixon 1980:305)—and the "...[i]nstrumental coincides with [the] ergative, exactly as in Dyirbal" (cf. Dixon on loc. cit.)

Sixth, Dixon 1980:305 also reports that "Barry Blake has pointed out that in Yalarnnga, a close genetic relative of Kalkatungu, locative-a is -ŋga [only] on ... [bisyllabic] stems (all stems in Yalarnnga end in a vowel)". Seventh, Dixon 1980:306 characterizes the ergative marker of Warlipiri (also known as "Walbiri") as being "-ngkù after a ... [bisyllabic] nominal and -rìu after a stem of three or more syllables. ...[Eighth, also in Warlipiri,] locative exactly parallels ergative except for the final vowel; it is -ngkà after two and -rìa after three or more syllables."

Ninth and tenth, and finally (for Australia)—to return to Dyirbal—Hankamer 1973 and "TSPi":§3.1.1.3 overlook Dixon's 1972 syllable-totaling characterization of that language's nominal verbalizing morpheme -màl/ (m)bal and its reflexive morpheme -màriy/-(m)bàriy. That is, regarding the former, "...[a]ny noun or adjective may be verbalised ... into a transitive ... stem by the addition of: -màl to a stem of two syllables; -(m)bal to a stem of more than two syllables" (cf. Dixon 1972:85-86). Thus, cf., e.g., 'bend' warù/warùmàl 'make bendy', vs. 'many bends' warùwarù/warùwarùbal 'make very bendy.' Similarly, a 'reflexive verbal form can be derived from any transitive ... -y root... [(as opposed to -I root) by] add[ing] -màriy, to a root of two syllables; ... -(m)bàriy, to a root of more than two syllables" (cf. Dixon 1972:89). We thus have, for example 'search' gùniy/gùnimàriy '(reflexive)', vs. 'repeatedly search'
güniguniy/günigünibáriy 'reflexive'.

Most spectacular, though, is the case of the Australia language Lardil (described briefly but formally in Hale 1973 and more extensively but less formally in Hale, Farmer, Nash, and Simpson 1981-MS). Lardil has fully nine examples of syllable-totaling morpholexical rules, which therefore brings the number of such rules so far motivated for Australian languages to nineteen—not counting the two processes already collected for such languages by Hankamer 1973 and "TSPI":§3.2.2.3 (making a total of twenty-one).

Four of the Lardil rules in question concern verbs. First, Hale, Farmer, Nash, and Simpson (henceforth "Hale et al.") 1981-MS:18-19 report that transitive verbs are detransitivized as passives or reflexives via the addition of -yi to monosyllabic bases and of "-V (i.e., a copy of the final vowel...)", to polysyllabic bases. Thus, the base /ne/ 'hit; kill' is detransitivized as neyi 'be hit, killed', but were 'throw' and jembekira 'kick' are detransitivized as weree 'be thrown' and jembekiraa 'be kicked', respectively. Second, Hale 1973:436n.39 and Hale et al. 1981-MS:20-21 report that the "generic and nominalizing suffix" -n may be added to verbs of any length but triggers vowel lengthening only in monosyllabic verbs. Thus, contrast /ne/ 'hit; kill' and neen 'hitter; killer' with were 'throw' and wern 'thrower; throwing'.

Third, Hale et al. 1981-MS:10, 18 note that the "sequential imperative" morpheme -rr (= an apico-domal flap; cf. also p. 1) triggers lengthening of the vowel in a monosyllabic verb-base but not of that in a polysyllabic verb-base. Compare, e.g., ne 'hit; kill' and neerr 'and then hit/kill!' with were 'throw' and wererr 'and then throw!'. Fourth, and perhaps most signifi-
cantly, Hale 1973:436n.39 reports that monosyllabic verbs (but not nouns, etc.) undergo suffixation of an augment -tha when they are not suffixed with an affix other than non-future -kun. The -th in -tha is a lamino-dental stop [t] or fricative [θ]; cf. Hale 1973:421n.25 and Hale et al. 1981-M5:1, 9— who also suggest that, in -tha, -th- is a thematic increment and -a is a vocalic augment.

These facts concerning the interaction of monosyllabic bases, -tha, suffixal -kun, and the other verbal suffixes of Lardil can be analyzed as follows. The rule of -tha augmentation applying to monosyllabic verb-stems is ordered after all the verb suffixation rules of Lardil except suffixation of -kun (which Hale et al. 1981-M5:12 relabel the "actuality suffix", for actual happenings in the past or present). As examples, contrast /ne/ 'hit; kill'; netha 'hit; kill (plain form: imperative and general non-future)' and nethakun 'hit; kill (non-future actual)' with /were/ 'throw', were 'throw (plain form)', and werekun 'throw (non-future actual)'.

Lardil's fifth through ninth morphological syllable-counting rules involve nouns. Just as monosyllabic verbs are augmented by -tha (if they bear no suffix other than -kun; cf. above), so monosyllabic noun bases are said by Hale 1973:427 to undergo "a process of 'augmentation' ... which adds a syllable.... By augmentation, a syllable of the shape /S\a/ , where /S/ is a stop consonant homorganic with the stem-final [consonant], is suffixed to the base--the homorganic stop appears in the augment if the stem-final consonant is a sonorant other than /r/; if the stem-final [consonant] is an obstruent or /r/, the augment is simply /a/." Hence, the bases /ril/ 'neck', /yak/ 'fish', and /yurr/ 'body' respectively have plain forms (for the imperative and general non-future) as follows: rilta, yak-a, and
yurra.

Hale et al. 1981-MS:21-22 (who provide some of the preceding examples) further explain that vowel-final noun stems also receive an augment consisting of -a alone—preceded by a y or a w following an i or u, respectively: cf., e.g., /ja/ 'foot' → jaa and /lu/ 'fat' → luwa. That all of the abovementioned stems are indeed underlyingly monosyllabic is strongly suggested by the fact that they appear unaugmented before, e.g., the future ending -ur, just as do polysyllabic stems like /bayi/ 'anger'. Thus, when, say, /ja/ and /bayi/ occur as the object of a verb in the future tense, they are marked for agreement in futurity via suffixation of -ur: as jawur and bayiwur, respectively (where the epenthetic glides are inserted by a general phonological rule of Lardil). The phenomena just discussed obviously constitute a fifth syllable-counting rule for Lardil morphology.

A sixth such example has to do with morphological apocope in nouns. According to Hale 1973:424 and Hale et al. 1981-MS:22, the final vowel of a noun stem which is underlyingly trisyllabic or longer regularly deletes on the surface (although there are trisyllabic exceptions to this). Consequently, the final vowel of a trisyllabic stem like /mayara/ 'rainbow' is retained when followed by the non-future suffix -n, but such a vowel disappears when its stem occurs in the unsuffixed plain form. This contrast is shown by, e.g., mayaran and mayar, respectively, plus parallel but tetrasyllabic /karikari/, karikarin, and karikar 'butter-fish'. The crucial thing about this rule is that it does not apply to pronouns, verbs, or particles. Thus, there is no apocope in ngakurri 'first person dual inclusive for two kinspeople of the same generation', binyari 'anoint with armpit sweat', or wirdeeku (an inherently imperative particle).
The seventh and eighth noun-morphological syllable-counting rules of Lardil have to do with, respectively, case marking and the abovementioned agreement marking for futurity on objects of verbs. For monosyllabic noun-stems ending in a vowel, the objective case is marked by suffixation of -in (followed by automatic phonological insertion of a glide y before the suffix)—so that /ja/ 'foot' becomes jayin, for example. But polysyllabic vowel-final stems are suffixed with just -n in the objective case, so that, e.g., mela 'sea', barnga 'stone', and /yalulu/ 'flame' become melan, bargonan, and yalulun, respectively (see Hale et al. 1981-MS:23-24). It should be noted that Hale 1973:421ff. discusses only some of these facts and calls the nominal case in question the 'nonfuture', since it really marks both accusative case in nouns and also tense-agreement with a governing non-future verb. In addition, this objective case is described by Hale et al. 1981-MS:25 as marking the agent of a passive verb in the plain form, the subject of a contemporaneous dependent clause, and the locative complement of a verb in the plain negative or the negative imperative.

A final syllable-totaling aspect of this seventh example is that the stem vowel u of "certain consonant-final monosyllables changes to i" when the objective-case suffix (= -in, for consonant-final stems) is added. Consequently, a base like /yurr/ 'body' becomes yirrin, rather than *yurrin (cf. Hale et al. 1981-MS:24). Significantly, the lexical limitedness of this rule shows that lexical correspondence can also involve syllable totaling.

The eighth instance of syllable counting among Lardil's morphological rules concerns the future-agreement marker on noun objects. Hale et al. 1981-MS:26-27 report that, for vowel-final stems, the future ending is -ur after monosyllabic stems and polysyllabic ones ending in -i ('with appro-
priate glide insertion"), but just -r after other polysyllabic stems. Contrast, for example, /lu/ 'fat' and luur, or /bayi/ 'anger' and bayiwur, with mela 'sea' and meler.

The ninth and final syllable-totaling rule in Lardil morphology is a vowel-lowering rule (or set of rules). Hale 1973:422(n.26)-423(n.27) provides some initial information which is supplemented by Hale et al. 1981-MS:22. In the words of the latter, final vowels of nouns undergo a change: "(1) ...[i]f the base-form is ... [bisyllabic] ... [from] ... [bases] ... [to a] (if a lamino-alveolar precedes); (2) ...[i]f the base-form is ... [bisyllabic] ... [from] ... [bases] ... [to a]". Illustrative examples include /kenți/ → keňte 'wife', /payi/ → parya 'anger' (since "/y/" is lamino-alveolar) and /ŋawu/ →ŋawa 'dog'; contrast /lu/ → *la (→ *laa, by augmentation) vs. /lu/ → /lua/ → luwa (by morphological augmentation and phonological glide insertion). Since trisyllabic noun-stems undergo deletion of their final vowels (cf. above), it actually is impossible to tell whether they undergo final-vowel lowering--although this is not discussed by Hale 1973 or Hale et al. 1981-MS.

However, those works do provide clear evidence which can be used to demonstrate that the syllable-totaling Lardil rule of lowering at issue here really is morphological. Hale et al. 1981-MS, for example, make it clear that no lowering occurs in bisyllabic verb-stems (cf. budi 'fall', e.g.), pronouns (cf., e.g., nyingki 'second person singular'), or particles (like inherently imperative thaldi). Furthermore, Hale 1973:423n.27 points out that bisyllabic nouns do not undergo final-vowel lowering "before" (as it were) "the vocative--a phonologically vacuous ending... [which] inhibits the application of ... other ... rules as well". Thus, /kenți/ appears exactly as keñtı in the
vocative form 'wife!'. Hale loc. cit. also points out that the lowering rule in question must be ordered before (and thus counterfeeding) a phonological process in Lardil by which final consonants may optionally be deleted (since feeding order would produce the wrong results here: e.g., for future /kenṭ’in/ → kenṭi → *kenṭe vs. /kenṭ’in/ → kenṭi).

From the preceding pages, then, it is clear that Lardil has nine syllable-totaling rules. According to the present rule-typology, these processes are all morphological (or lexical-correspondence) rules, since they all mention specific morphological categories and/or lexical or at least syntactic categories. The large number of morpholexical syllable-totaling operations in Lardil is thus consistent with the two facts that, on the one hand, other mor-
pholexical examples of such rules are already known to exist and that, on the other hand, no valid phonological syllable-totaling rules have to date been successfully maintained. (Some alleged examples of this type will be discussed below and shown to be invalid). It therefore seems preferable to conclude that the Lardil rules in question really are not purely phonological in type, but rather morpholexical (and in fact mostly morphological). This move then provides independent support for a processual approach to mor-
phology, since some of the Lardil syllable-totaling processes do not perform morphological operations of affixation but instead ones of subtraction and/or replacement.

Due to the relative neglect of process morphology especially at the time when Hale 1973 was writing, though, we can now understand why that au-
thor explicitly characterized as "phonological rules" all of the syllable-total-
ing rules in Lardil discussed by him. That is, Hale unmistakably treats, say, the process of apocope which is limited to trisyllabic or longer nouns as be-
ing on a par with purely phonological, completely non-morphological rules of the language like those deleting the second member of a final consonant cluster (cf. Hale 1973:425) or deleting a final non-apical consonant (cf. p. 426). And he does this despite also giving explicit recognition to the fact that "the forms which ... concern us in this ... [analysis] are [only] inflected nouns (and adjectives, which, so far as ... [we are] concerned [here], behave identically)" (p. 421)--and despite statements in footnotes (pp. 423n.27 and 436n.39) showing that certain nominal and verbal categories of Lardil have different syllable-totaling rules even for words having the same length in syllables.

There is a methodological or at least practical moral involved here: namely, it is potentially misleading and even dangerous for linguistic analysts to present descriptions of only parts of a language's sound structure and to suppress or downplay the differential behavior of various parts of speech vis-à-vis sound-structural rules. Because Hale 1973 did this, Kenstowicz and Kisseberth 1979:109-115, 197-198, 300-305, 315-316 interpret several of Lardil's morpholexical syllable-totaling rules as being purely phonological and so present them that way in their introductory textbook--one of the most widely used in all of GP. As a result, thousands of phonology students (including this one, for a time) have mistakenly been led to believe that phonological syllable-totaling rules exist--sometimes even multiply in one language. (In fact, many of the exercises that Kenstowicz and Kisseberth 1979 present in their text also suppress the morpholexical conditioning of the real processes in the languages which they are taken from).

Nevertheless, as reviewed here, the evidence in Hale 1973 and Hale et al. 1981-MS suffices to show that Lardil has no phonological syllable-total-
ing rules at all, but nine morpholexical (mainly morphological) ones. It must
be admitted that not all of these latter processes are completely independ-
dent of one another. For example, the nominal and verbal augmentation-
rules for monosyllables and the nominal apocope-rule for trisyllabic and
longer forms seem to be not unrelated. As Hale 1973:427n.33 points out, it
is "tempting to view th[ese]... process[es] as 'conspiring' with ... [one another
in order] to ensure that uninflected nominal [and verbal] forms [all] approach
as closely as possible ... [bisyllabic] length." Still, the fact that apocope af-
fected only nouns, and even then deletes only one vowel from trisyllabic and
longer nouns, suggests that the rules in question cannot really be reduced
to instantiations of a single principle. Rather, they at most form a "rule con-
And most of the Lardil morpholexical syllable-totaling rules are
essentially unrelated to one another, involving as they do various vowel
changes and the suffixation of different elements in different categories.

The nine separate morpholexical syllable-totaling rules of Lardil thus in-
deed bring to nineteen the number of such rules in Australian languages
collected here as a supplement to the two valid cases presented by Hanka-
mer 1973 and "TSPI":§3.1.1.3. It must again be admitted that the shock val-
ue of this massive presence of morphological syllable-totaling rules in Aus-
tralian languages is somewhat offset by the fact that, as concluded by Dixon
1980:228, "...[i]t seems clear... that nearly all the languages of Australia form
one genetic family, going back to a single original language, p[roto-]A[ustra-
lian]." Still, on the one hand, nearly all of the abovementioned syllable-to-
taling rules in Australian language are different from one another except
those for the ergative and locative. And, on the other hand, syllable-totaling
variation in the allomorphs is not reconstructed for the proto-Australian etyma of these categories. Dixon 1980:320 (cf. also the surrounding text on pp. 311-322), for example, reconstructs ergative *-1u and locative *-1a.

Indeed, the Australian languages have had so much time to develop from proto-Australian that their frequent syllable-total-conditioned ergative and locative allomorphy is significant regardless of whether it was jointly inherited or else independently innovated. That is, Dixon 1980:228 suggests that it "is likely that proto-Australian was spoken ... probably at least 10,000 years ago and quite possibly longer." Thus, the Australian languages have had every chance to level out syllable-totaling rules of morphology—especially if there is something marked about these. But, even if such processes are an areal feature due to contact and borrowing, it is still likely that there is nothing very marked about morphological syllable-totaling rules, since in that case they would have to have been so readily borrowed. It must be concluded, then, that the widespread presence of syllable-totaling rules in the morphologies (and, to a much lesser extent, the lexicon) of Australian languages is indeed significant.

However, syllable-totaling morphological rules are by no means limited to Australia, as already suggested by Hankamer's six non-Australian examples summarized above. Here, we can consider three more such cases—which bring the total of new syllable-totaling rules of morphology discussed here to twenty-two. First, Sommerstein 1973:149, 151-156, 187 [(34)], 1977:208 [(229)] describes for Ancient Greek a "Desinential Accent" (1977) "Rule of Monosyllables" (1973) which applies to the genitive- and dative-case endings of non-participial third-declension nouns just in case the root preceding them is monosyllabic. (Since this rule itself assigns suffixed pitch-
accent, it obviously is not dependent on stress.) Sommerstein formulates this rule roughly as follows:

\[ V \rightarrow [+\text{high pitch}] / \# C_0 V C_0 + \left\{ \begin{array}{l}
-\text{PARTICIPIAL} \\
+3\text{RD DECLENSION} \\
+\text{GENITIVE} \\
+\text{DATIVE}
\end{array} \right\} (V) C_0 \# \]

A reformulation of this rule in terms of more current Multilinear Phonology (where "ω", "μ", and "σ" = 'word', 'morpheme', and 'syllable', respectively) might be as given below:

\[ \text{Tone} \rightarrow [+\text{HIGH}] / \]

\[ \omega \]

\[ \mu_1 \]

\[ [+\text{ROOT} \\
+3\text{RD DECLENSION}] \]

\[ x \]

\[ \sigma \]

\[ x \]

\[ \mu_2 \]

\[ [-\text{PARTICIPIAL}] \\
+\text{GENITIVE} \\
+\text{DATIVE} \]

\[ \sigma \]

Second, Aavik 1982:l-li, Viks 1982:24-25, and Lehiste 1983:180-181 describe for Estonian a situation where the allomorphy in that language's partitive plural is distributed partly according to syllable-totaling principles (as well as mora-counting principles, although the latter are for simplicity's sake ignored here; regarding Estonian quantity in general, cf. Lehiste 1977, Prince 1980, and their references). The three relevant markings for the Estonian partitive plural—which is built on whichever of the genitive-singular or partitive-singular stems is ungraded—are vowel replacement, -id suffixation, and -sid suffixation. The determination of which of these markings for the partitive plural a particular noun builds onto the relevant stem (here...
henceforth simply "stem") is made as follows.

Partitive-plural formation by vocalic change is obligatory for all native stems which are tetrasyllabic or longer, as well as for those trisyllabic stems which contain an overlong syllable. It is optional—but favored—for certain bisyllabic stems with overlong first syllables. The ending -sid is added to most monosyllabic partitive-plural stems. In addition, -sid regularly marks partitive plural for nouns with bisyllabic stems: obligatorily (albeit subject to certain suffixally conditioned exceptions), for stems which have no overlong syllables; otherwise optionally. Finally, -id obligatorily marks the partitive plural of all Estonian nouns which have a trisyllabic partitive-singular stem without an overlong syllable. But -id is also optionally suffixed to nouns which have a bisyllabic stem with an overlong second syllable. However, all of these latter forms are common integrated loanwords and are actually more often marked with -sid. Sporadically, -id marks the partitive plural of certain nouns with monosyllabic stems (which in Estonian are always overlong) and of certain loanwords with trisyllabic or longer stems.

The patterns just described make for a welter of forms, but Lehiste 1983: 181 provides the following clear examples (and cf. also the overview given here by the modified table from Vlks 1982 provided as Appendix V immediately following this chapter). The nominative-singular forms puna-ne 'red', endi-ne 'former, earlier (one)', and inime-ne 'person, human being' have the respective partitive-plural stems (here equivalent to the full genitive singular) puna-se-, endi-se-, and inime-se-. Since the first of these has no overlong syllables and is trisyllabic, its partitive plural is puna-se-id. But, because the latter two are, respectively, a trisyllabic form with an overlong first syllable and a tetrasyllabic form, their respective
partitive-plurals are marked by a change in their final vowel from e to i; cf.
endi-s-i and inime-s-i. Furthermore, Viks 1982:24-25 shows that the
noun 'speech' has the overlength-free bisyllabic stem-form kőne- and
therefore obligatorily appears as kőne-sid in the partitive plural. (In the
case of -id and -sid, by the way, it is probable that ...(−)... represents
'plural' and −d represents 'partitive'. (I am grateful to Joel Nevis for exten-
sive help in arriving at an analysis of these and all the other Estonian facts
mentioned here.1)

A third and final non-Australian example of a heretofore-uncollected syl-
label-totaling morphological rule comes from Spanish— from the dialects
described by Harris 1979:290-291, 293 and Jaeggli 1980. In this dialect
(group), the regular diminutive-suffix has two main allomorphs: -(e)it- and
-(e)cit-. For vowel-final nouns, the diminutive form -(e)cit- is affixed to
bisyllabic bases: cf. e.g., madre 'mother' and madrecita 'little mother',
saurio 'saurian' (= [sā′yɾyol]) and sauriecito 'little saurian'. But only
-it- is affixed to bases that are trisyllabic or longer: cf. e.g., comadre
'woman friend' and comadrita 'little woman-friend', and dinosaurio
'dinosaur' and dinosaurito 'little dinosaur'. (Monosyllabic vowel-final
nouns are very rare and marked in Spanish—and their diminutives even
rarer and more marked.) It is also significant that the Spanish syllable-
counting diminutivizing rule is sensitive to the number of syllables only in
underlying representation. I.e., cf. Harris 1979:291 for contrasts like
preludio (< /preludyo/) 'prelude' and preludito 'little prelude' vs.
estudio (< /studyo/) 'study' and estudiecito 'little study', where pho-
netic trisyllabicity in estudio is derived by phonological prothesis.

With this twenty-second newly-collected example, we can conclude that
the claim of Hankamer 1973 and "TSPI" that there are morphological syllable-totaling rules in human language is now completely well supported beyond any reasonable doubt. When the cases first surveyed here are added to the seven of Hankamer and "TSPI", we reach twenty-nine morphological (or at least morphosemantic) syllable-totaling rules.

On the other hand, it must, to repeat, be pointed out that two of the cases proposed by Hankamer 1973 (and seconded by "TSPI") turn out not to be valid examples of morphological syllable-totaling rules, after all. The first probably involves merely an oversight. Instead of the Dyirbal transitive verbalizer -mal/-mabal (cf. above and Dixon 1972:85-86), Hankamer 1973 and "TSPI":§3.1.1.3 mistakenly report that the homophonous instrumentive/comitative verb-suffix occurs as -mal after bisyllabic roots but as -mabal after trisyllabic or longer stems. The latter work also mislabels the instrumentive as "instrumental" (which is a nominal morpheme) and incorrectly states that Dixon 1972:283-284 inserts the -m... in -mabal by a general phonological rule—which is manifestly not true for instrumentive/comitative -mabal and is in fact only a strong tendency for the transitive verbalizer -mal. For the instrumentative/comitative, though, Dixon 1972:85, 96 reports that "verbal stems are put into instrumentative form by the addition of: -mal, next but one after a stressed syllable; -mabal, in all other cases (that is, after a stressed syllable, or after a sequence of two unstressed syllables)", and that a homophonous affix (with the identical pattern of allomorphy), when added "to an intransitive verbal stem[,] produces a form that functions as a transitive stem, marking ... a comitative construction".

Here, it is absolutely clear from Dixon's descriptions that the total number of syllables in a form is irrelevant to the choice between -mal and
-mba1. Rather, only the number of unstressed syllables between an instrumentive/comitative suffix and the nearest preceding stressed vowel matters. If there are zero or two such unstressed syllables, then -mba1 is chosen; if there is exactly one such syllable, then -ma1 is selected. However, Dixon 1972:38 earlier makes it clear that Dyirbal has an alternating stress-pattern—with secondary stresses regularly following a primary (normally initial) stress at a remove of one syllable. From this, it follows that a sequence of two "unstressed" syllables after a "stressed" syllable is in reality a sequence of unstressed syllable plus secondarily stressed syllable, both following a primarily stressed syllable. But, then, we can say that, for the instrumentive/comitative, -mba1 occurs immediately after a stressed syllable (whether the stress is primary or secondary), while -ma1 occurs immediately after a completely unstressed syllable.

In this way, it is obvious that the choice of allomorphs for the Dyirbal instrumentative/comitative suffix(es) -ma1/mba1 depends on the location of stress (as immediately preceding or not)—or, perhaps better put, on the presence or absence of stress (immediately preceding)—and not on the total number of syllables in a form. Still, it is puzzling that Dixon 1972:38 does not explicitly make this statement, even though he mentions the suffixes for instrumentive/comitative (the latter there called "accompanitive") in connection with stress. Likewise puzzlingly, Dixon 1972:38 also implies that the choice of allomorphs for the Dyirbal ergative/instrumental suffix(es) -ngu/-gu on vowel-final stems depends on stress placement. However, he later (p. 42) makes it clear that stress is not crucial here, since bisyllabic stems (which take -gu) act differently from tetrasyllabic stems (which take -ngu) even though both stem types end in unstressed vowels (cf. also above).
Apparently, Dixon 1972 revised his analysis for certain phenomena (like stress-conditioned vs. syllable-total-conditioned allomorphy) in the middle of writing his book but did not go back and make all early statements consistent with later ones.  

A second example of a putative syllable-totaling morphological rule that must nevertheless be rejected (pace Hankamer 1973 and "TSP!": §3.1.1.4) involves Modern Greek. The case is apparently based on early work by Kaisse which later appeared in radically different form as Kaisse 1982. As presented by Hankamer, the relevant generalization is that the so-called "augment" e appears as a prefix in the Greek aorist indicative only for those verbs that are monosyllabic or bisyllabic (including their desinential suffixes). Thus, Hankamer compares forms of πένο 'I wash' (with a transcription error of u for i corrected below) and τρελ(l)ανομαί 'I go crazy':

(3)  

\begin{tabular}{lll}
  & 1st person & trélan-a  \\
singular & 2nd person & trélan-es  \\
  & 3rd person & trélan-e  \\
  & 1st person & plín-ame  \\
plural & 2nd person & trelán-ame  \\
  & 3rd person & trelán-ate  \\
  & 3rd person & trélan-an  \\
\end{tabular}

From such data, Hankamer 1973—again, seemingly following Kaisse—concludes that the overriding consideration here is that Modern Greek verbs in the aorist indicative must have antepenultimate stress. If a stem plus its person ending does not have the minimum of three syllables required for such accentuation, then the augment is realized as an e- prefix in order to serve as a placeholder for stress—but only then. Otherwise, the augment is "marked" by zero. Since this kind of augment prothesis (or pre-
fixation) occurs only in the aorist indicative, it would thus indeed seem to be a morphological rule.

Less clear, though, is whether the rule as presented by Hankamer 1973 is necessarily syllable-totaling. It is true that antepenultimate stress requires at least three syllables in a word. But, beyond that, the number of syllables in a word is irrelevant. In another sense, then, the morphological augment prothesis rule of Modern Greek seems to be directly dependent only on stress, and just secondarily to depend on the total number of syllables in a word.

The waters here have been further muddied by the fact that Kaisse 1982 considers the process of augment prothesis as sketched above to be purely phonological, rather than at all morphological. Such a conclusion is open to debate, but what is more important is that further data than those originally considered by Hankamer and Kaisse show the occurrence of augments in Modern Greek not to be determined by reference to either the total number of syllables or the placement of stress in a word.

For example, Joseph and Janda [forthcoming] and Joseph [in preparation] observe that the augment e occurs in some words where there are already enough syllables to bear antepenultimate stress even without augmentation. Thus, the complex form kata-lavéno 'I understand' has the aorist (indicative) form katá-lav-a, with no augment, but kata-laváno 'I seize' has the augmented aorist kat-é-lav-a. This latter form is also striking because hiatus of ...a + e... is usually resolved by deletion of e. Thus, e.g., ta + éfera 'them' + 'I brought' (= 'I brought them') may become tá + fera. (On this instantiation of "Chatzidakis' Law", see, e.g., Sanders 1970/1972/1974; for an opposing view, see Kaisse 1982, 1985:97-98,
Cases like the above—with minimal pairs—suggest that the principles effectively governing the Modern Greek augment are lexical(ized) and so do not primarily refer to either the location of stress or the total number of syllables in a form. Such a view is strengthened by further examples where there occur unstressed augments. Thus, zo 'I live' has the aorist e-zus-a, and to the abovementioned first-person singular aorist form kat-é-lava there corresponds the related plural-form kat-e-láv-ame 'we seize'.

It may be the case, of course, that some earlier stage of Modern Greek had an augment rule like that described by Hankamer 1973 (or Kaisse 1982). However, in the absence of new evidence to that effect, it must be concluded that the facts of Modern Greek do not motivate a syllable-totaling rule for the aorist-indicative augment e—morphological or otherwise.

It still remains, however, to address the challenge posed by other languages to Hankamer's 1973 (and Anderson's 1975) claim that syllable-totaling rules are always morpholexical and never phonological. One such potentially threatening case has actually here already been made unproblematic. Above, it was briefly mentioned that Hale's 1973 limitation of his account of Lardil mainly to nominal forms has led some scholars within GP (such as Kenstowicz and Kisseberth 1979) to conclude that the syllable-totaling rules of Lardil apocope and augmentation etc. are purely phonological. However, we have already seen abundant evidence above (partly based on footnotes in Hale 1973, but mainly on Hale et al. 1981-MS) demonstrating that all of the relevant rules in Lardil refer to the categories Noun and Verb or else to their subcategories. As mentioned very briefly in Chapter IV earlier, this situation reinforces the decision made there to consider
features like [+Noun] and [+Verb] as morphological ones whose presence in a rule ipso facto makes it non-phonological (and non-phonetic)—hence either morphological or lexical (i.e., morpholexical).

One further challenge to the Hankamer/Anderson claim, though, comes from Hale 1973. On pp. 427n.33, 437n.41 and 440-441, Hale discusses facts from Yanggal, a dialect of the other language (than Lardil) spoken in the Wellesley Island group of Australia. Hale 1973:440 there reports that "deletion of final /a/ is not limited to uninflected nominals [(as in Lardil)], since it applies to all polysyllabic ["i.e. longer than ... [bisyllabic]]" words. He gives nominal examples of such apocope, like /paṭaka/ → paṭak 'stomach' and /kunawuna/ → kunawun 'child', as well as the verbal example /kuri+na/ → kuriṇ 'Don't look!'. That monosyllables fail to lose their vowels to this process is not really surprising—since they contain only a stressed vowel, and stressed vowels do not normally delete. And, because Yanggal presumably has initial stress—like Lardil (cf. Hale et al. 1981-MS: 8), Dyirbal (cf. Dixon 1972:38), and in fact most Australian languages (cf. Dixon 1972:3, 1980:128)—it might be expected that final vowels of non-monosyllabic words should delete, since they could not bear primary stress. (They could, though, bear secondary stress in words with odd numbers of syllables, given the general Australian tendency for alternating stress—cf. the references just given). What is unexpected, though, is that only the final vowels of bisyllabic words should fail to delete, especially because these vowels do not bear even secondary stress.

Still, if final a should turn out to delete in all Yanggal words except bisyllabic ones—regardless of morphological or lexical categories—then we would indeed seem to be confronted with a purely phonological syllable-to-
taling rule, in violation of Hankamer's 1973 (and Anderson's 1974a, 1975) claim. Unfortunately, though, Hale 1973 presents so little information about Yanggal that this issue cannot really be resolved. In particular, he provides no examples of underlying vowel-final roots, and so one cannot tell whether bisyllabic roots fail to undergo final deletion because Yanggal has a syllable-totaling restriction on a purely phonological rule or because bisyllabic roots simply do not exist in the language. (In the latter case, we would obviously not face a counterexample to the morpholexical constraint on syllable-totaling rules which is generally at issue in this overall section.) Thus, Hale presents several underlyingly consonant-final monosyllables and numerous consonant-final bisyllabic words of Yanggal, plus three trisyllabic or longer nouns and one trisyllabic verb (all of which latter undergo deletion of final a). And Hale also mentions that Lardil and Yanggal are "closely related" (p. 441) and share certain types of inflections (if not the same allomorphs--cf. p. 440).

On the other hand, "...[i]n its treatment of uninflected stems, Yanggal differs from Lardil rather strikingly. Yanggal augmentation applies to all stems, regardless of length, which end in a sonorant other than /r/--the augment ... [being] a homorganic stop consonant" (Hale 1973:440). Furthermore (p. 441), "...[i]t is evident ... that ... Lardil has innovated a great deal during its development as a separate linguistic tradition within the Wellesley Islands group." Thus, it is possible that only Lardil has innovated vowel-final bisyllabic (and monosyllabic) stems--just not Yanggal. Given all this (or, rather, given only this), it seems that the issue of whether Yanggal has vowel-final bisyllabic roots must be left up in the air--and hence also the question of whether Yanggal has a purely phonological syllable-totaling rule that de-
letes final a in all kinds of words except bisyllabic ones. Pending further information regarding the root structure of Yanggal nouns and verbs (and also regarding pronouns and particles), therefore, we may here conclude only that the language provides a potential counterexample to the claim that there can be (and are) no purely phonological syllable-totaling rules.

Matters are quite different, though, as regards the last possible case of a language alleged to have one or more purely phonological syllable-totaling rules: YidinY. It should be mentioned at this point that many stress rules which were once analyzed as counting the total number of syllables in words have now been reanalyzed, in Metrical Phonology (cf. the references in Appendix II above), as proceeding to effect foot construction from one end of a word or another—or over syllables with certain characteristics—without any need for such syllable-totaling. Thus, because "TSPI":§3.1.1.4 was written before the current heydey of Metrical Phonology, we can understand why it is now unnecessary to accept the claim made in that work that "there is ... good evidence from many languages of purely phonological rules, often stress placement processes, that count the number of syllables in a form." However, Dixon 1977a, 1977b has proposed an analysis of YidinY where fully six non-accentual purely phonological rules must refer to whether the total number of syllables in a word is even or odd.

"TSPI" therefore went on to state: "Hankamer[s 1973] ... claim that ONLY allomorphy rules could be sensitive to number of syllables, and never purely phonological ones[,]... seems ... to have little chance of withstanding the facts Dixon cites from YidinY." Nevertheless, Hayes 1992 (based on 1980:196-228/1981:123-143) is able to demonstrate that the analysis of YidinY phonology within a Metrical-Phonological framework allows an ac-
count of the relevant facts—for all six rules—which is not only more elegant but also eliminates any need for reference to the total number of syllables in a word. Rather, all that is needed is reference to whether a certain syllable (having a particular position within a metrical foot of a word) is strong (= stressed, perhaps secondarily) or weak (= unstressed).

The six Yidin' non-accentual phonological rules alleged by Dixon to depend on whether the total number of segments in a word is odd or even are the following: (1) Penultimate Lengthening (cf. 1977a:6 [(13)]), (2) Illicit Length Elimination (cf. 1977a:18 [(14)]), (3) Final Syllable Deletion (cf. 1977a:15 [(23)]), (4) Rhotic Dropping (cf. 1977b:127, 129), (5) Nasal Cluster Simplification (cf. 1977b:132-133), and (6) n Drop (cf. 1977b:135). What is initially unusual about these rules is that they do not really refer to what the actual number of syllables in a word is, just to whether that number is odd or even (i.e., whether the remainder left from dividing the number by 2 is 1 or 0). As Hayes 1982:101 points out, such numerous "rules which delete or modify segments based on an odd-even syllable count are ... a colossal coincidence..., particularly when the language in question has an alternating stress pattern." Hayes, therefore provides Metrical-Phonological reformulations for the first three of Dixon's aforementioned rules (in Hayes 1982:103, 106, 104, respectively) and suggests how the other three would look. Each, namely, would simply refer to a strong or a weak syllable, among other things. For such reasons, then, we must prefer Hayes' metrical analysis of Yidin' phonology over Dixon's syllable-totaling one. This decision thereby removes at one stroke all the counterexemplary potential that "TSPI" had expected from Yidin' against the claim that there are no purely phonological syllable-counting rules.
It is true that Dixon 1977b also proposes two syllable-counting rules for YidinY which are morpholexical in terms of the present rule-typology (even though Dixon considers them to be "phonological", as does Hayes 1982: 100-101). These two processes are y deletion (before -nda [Dative]; cf. Dixon 1977b:130) and Genitive i Backing (1977b:135-136). These rules, too, not only become more elegant under the metrical analysis of Hayes 1982 but also cease to be syllable-totaling processes of morphology. Still, there are two reasons why this is no real cause for sorrow. First, the fact that the two rules in question referred only to even vs. odd numbers instead of absolute totals suggests that they really weren't (the right kind of) syllable-totaling processes, anyway. And, second, giving up two morpholexical syllable-totaling rules seems a small price to pay in return for simultaneously eliminating six counterexemplary phonological syllable-totaling processes--especially when twenty-nine morpholexical syllable-totaling rules have already been solidly motivated.

To close this consideration of proposed counterexamples to the claim (of Hankamer 1973, followed by Anderson 1974a, 1975) that there are no purely phonological syllable-totaling rules, then, we can conclude that no clear cases of the latter have so far been demonstrated to exist. Hayes 1982 (following 1980/1981) has eliminated all the putative examples from YidinY adduced by Dixon 1977a, 1977b, and the present reconsideration of Hale 1973 (especially with the aid of Hale et al. 1981-MS) has removed all of the instances once thought to be provided by Lardil. Finally, the lack of data in Hale 1973 (or anywhere else) regarding one possibly syllable-totaling rule in Yanggal forces us to conclude that it is at best a potential counterexample. At present, then, there simply are no convincing phonological
(or phonetic) rules that total syllables. Given the nearly thirty well-supported instances of morpholexical syllable-totaling rules, on the other hand, it seems that we can indeed legitimately say that Hankamer's (and Anderson's) claim is still a valid one. In fact, it is, if anything, more strongly borne out by the available evidence now than it was nearly thirteen years ago. (Regarding the issue of syllable-totaling rules in syntax, though, nothing will be said here. Instead, cf. "TSPI".)

If we stand back for a time and consider the above findings vis-à-vis the task of constraining the theory of grammar in general and of sound structure in particular, we might a priori feel that, while prohibiting phonetic and phonological syllable-totaling rules is a positive achievement, having to allow morphological and lexical-correspondence rules that total syllables is a negative step. Of course, though, the facts force us to relax our constraints on sound structure to at least this extent. Furthermore, we can impose some restrictions even on morpholexical syllable-totaling processes. It turns out that none of these rules motivated so far refers to, say, words with seven syllables to the exclusion of all others. Indeed, quite the opposite is the case: none of the syllable-totaling morpholexical rules motivated above refers to a number other than one, two, three, or four or more. This allows us to impose on morphology and the lexicon the extremely strict constraint that syllable-totaling processes may involve only a subset of those four numbers. As far as such rules are concerned, then, counting proceeds simply as "1, 2, 3, many (= 4 or more)", and even the last of these is rare (but cf. the Estonian partitive plural above). For some interesting parallels in the linguistic expression of both grammatical and real-world number, see Greenberg 1978.
In any case, though, the generalization that only morpholexical rules can be dependent on the total number of syllables in a form indeed seems to be an extremely well-supported one. And so phonological and morphological theory also needs to distinguish morphological and lexical-correspondence rules, on the one hand, from phonetic and phonological rules, on the other hand. Otherwise, it would not be possible to impose a constraint on the latter to the effect that they cannot refer to overall syllable-totals. It should once again be stressed, in this regard, that Hankamer's and Anderson's term "syllable-counting" does not mean what it seems to suggest at first blush. Clearly, many stress rules--even in Metrical-Phonological reformulations--effectively need to count syllables (e.g., a certain number of them before the end of the word, or after its beginning). But, when they are properly formulated, such rules apparently need not refer to the total number of syllables in a form. In any event, it is remarkable that a condition dealing with something as seemingly different as whether rules can refer to syllable totals should dovetail with the typological distinction between morpholexical rules (morphological/lexical-correspondence ones) vs. phonetic/phonological rules--but it does indeed do so. A similar bipartitioning of sound structure is also performed by the next condition on rule form, application, and ordering to be considered here.

V.2. The Weaker Crossover Condition.

V.2.0.

As a second constraint on sound structure which interacts differently with different rule types, we can consider the "Weaker Crossover Condition"
of Howard 1972a/1972b/1972c. This type of constraint grew out of a general observation—made independently and nearly simultaneously at the beginning of the last decade by a number of linguists—which Anderson 1980a: 20 characterizes as "... a quite natural insight about the operation of phonological rules: ... phonologically conditioned processes (as opposed distinctly to morphologically controlled ones...) are generally local in character."

The remainder of this section of the present chapter first reviews the various proposed formulations of such a constraint in the literature and selects one of Howard's versions as most empirically accurate and hence most appropriate. It is then demonstrated that the condition in question indeed applies differentially to the different sound-structural rule types. In particular, the Weaker Crossover Condition further validates the distinction made above (in Chapter IV and the preceding section of this Chapter V) between phonetic and purely phonological rules, on the one hand, and morpholexical rules (morphological and lexical-correspondence ones), on the other hand.

V.2.1. Previous Work on a Crossover Condition in Generative Phonology (GP).

Stong-Jensen 1971, Jensen and Stong-Jensen 1971, Palacas 1971, Howard 1972a/1972b/1972c, Jensen 1972, Jensen and Stong-Jensen 1973, and Jensen 1974 all developed proposals to the effect that, as Anderson 1980a:19 puts it, "... constraints should be imposed on the material that can intervene between the 'focus' (roughly, the affected segment) and the 'determinant' (roughly, the significant part of the environment which allows the rule to apply) of a rule[] ... only 'irrelevant' material can intervene."

More recently, however, there has been a good deal of controversy con-
cerning exactly how strong a form of such a constraint on intervening mate-
rial between focus and determinant (or "target"/"victim" and "trigger") in
phonological rules can be imposed. It now seems--in the aftermath of a re-
cent flurry of exchanges (e.g., Odden 1977, Jensen and Stong-Jensen
1979, Odden 1980)--that a condition which would prohibit another potential
determinant from separating focus and determinant is overly restrictive and
thus must be rejected. Rather, the strongest constraint that can be main-
tained appears to be Howard's 1972a/1972b:94/1972c "Weaker Cross-
over Condition":\textsuperscript{3} "No segment [in a string/form] may be matched with an
element in a rule other than the focus or determinant if that segment can al-
so undergo that rule."

According to this constraint, there could be no phonological rule of, say,
palatalization of obstruents before high front vowels which had a form like
that given in (2) below and whose variable term X was interpreted in such a
way that the rule applied not only to obstruents adjacent to the conditioning
vowel but also to non-adjacent ones--thereby producing, e.g., hypothetical
[p\textsuperscript{Y}anak\textsuperscript{Y}i] from /panaki/, as well as [anak\textsuperscript{Y}i] from /anaki/:

\begin{equation}
[-\text{sonorant}] \rightarrow \left[\begin{array}{c}
+\text{high} \\
-\text{back}
\end{array}\right] / X \left[\begin{array}{c}
+\text{high} \\
-\text{back}
\end{array}\right]
\end{equation}

What is equally significant about this Weaker Crossover Condition, how-
ever, is that, while it holds strongly for phonetic and purely phonological
rules, the constraint does not seem to hold for morpholexical rules. Hence,
while one thus obviously cannot cite any real phonetic rules that disobey
the Condition, at least two morpholexical rules that violate it have been dis-

For the Keresan dialect/language Acoma (spoken in New Mexico), Mil-
ler 1965:81-82 et passim describes a process of "accent ablaut" whereby all preceding tonal accents of a stem become high when that stem is suffixed with any one of a certain set of suffixes (themselves usually high-toned in accent). Thus, for example, the stem dyāna 'four'--with a falling-accented syllable followed by a non-accented (and thus low-toned) syllable--has a high-toned accent on both of its syllables when suffixed with -wá 'times': cf. dyānáwá 'four times'. Following Miller, Anderson 1979a:12 formulates roughly the following rule of "accent ablaut" (presupposing the usual convention that the variable "X" may not contain a word boundary) and describes it as then quoted below:

\[ V \rightarrow [+\text{HIGH}] / ___ X [+\text{ABLAUT}] \]

"The effect of this rule is to replace the tonal accents of all vowels in ... [an] affected word by a 'high' accent ..."  "The ... rule ... applies when certain suffixes are added to a word. There is apparently no phonological characterization of the relevant class of affixes, and the rule must thus be considered to be conditioned by an arbitrary morphological property (at least from a synchronic standpoint)."

The relevant point about this example is that, if accent ablaut in Acoma were a phonological rule--and thus subject to the Weaker Crossover Condition--then only the rightmost vowel preceding the relevant ablauting suffix in a word would be able to become high-toned, rather than that vowel plus all of the intervening vowels (as actually happens). Obviously, then, Acoma accent ablaut cannot be a phonological rule, but only a morphological one--as it clearly is, since that rule (although not morphemically/lexically limited as to which roots or affixes it affects) nevertheless has a conditioning feature which is morphological.\(^4\)
A quite different but nevertheless parallel case is cited by Anderson 1979:13 from the Northwest Caucasian language group Abkhaz/Abaza, based on information in Allen 1956, Dumézil 1967, and Paris 1969. According to Anderson 1974b:447n.1, "... Abkhaz ... and Abaza ... are alike in all relevant details, though they differ somewhat in lower level phonology and, to a lesser extent, in lexicon."

The rule that concerns us here, however, is common to both of them: a dissimilation process that converts third-person plural verb-prefixes—which consist solely of the segment /r/—into [d] when they precede a stem which also begins with /r/. This /r/ can be either the initial segment of the root itself or else the entire causative-stem-forming root prefix /r-/. It is clear that this dissimilation is conditioned only by stem /r/’s because, in forms with two third-person plural /r/ prefixes before a non-r-initial stem, the first /r/ does not dissipilate. Thus, e.g., /y+r+a+r+[STEM h w]+d/ ('it-them-to-they-tell-aorist' = 'they told it to them') remains [y r a h w d].

Consequently, Anderson 1979:13 [(4)] formulates the rule in question more or less as follows:

\[
(6) \quad /r/ \rightarrow [d]/^{+[3RD-PERSON}^{+[PLURAL]}_{STEM \, r} X^{STEM \, r}
\]

The variable in the rule is necessary because "... any amount of other material may intervene between the prefix affected and the beginning of the stem (the Abkhaz[/]...Abaza verb allows a large number of positions for prefixes marking various functions)...."

Again, the relevance of this rule to our present concerns is that it allows us to determine whether the interpretation of the variable involved is subject to the Weaker Crossover Condition. That is, if the dissimilation rule above
were a phonological one, then we would expect it to be limited in its application to only the rightmost /r/ prefix in a word. However, forms with two /r/ prefixes show dissimilation of both of them: thus, Rule (4) above converts underlying /y+ stem r+ ba+ d/ ('it-them-they-cause-see-aorist' = 'they caused them to see it' = 'they showed it to them') into (more) phonetic [ydrdrbad]. But such non-compliance with the Weaker Crossover Condition is just what is expected from a morpholexical rule mentioning morphosyntactic categories like third-person plural in the way that Abkhaz/Abaza /r/ dissimilation does, since only phonological rules proper are subject to that constraint (as well as phonetic rules).

A third and final example of a morpholexical rule which violates the Weaker Crossover Condition—and perhaps the most impressive one—is documented for certain dialects of Maltese (Arabic) by Puech 1978. All Maltese dialects have some form of vowel harmony, in one widespread kind of which the vowels of certain suffixes harmonize in rounding with a preceding vowel. The dialects differ, however, as to which vowels can condition this rounding harmony. In one group of dialects, any vowel—whether in a root or in a suffix—can be a harmonic conditioner. In the other group of dialects, though, only root vowels trigger rounding harmony. And, correlating with this difference in, essentially, control of harmony which is phonological (= by any vowel) vs. morphological (= only by root vowels), there is a difference in Maltese dialects between whether vowel harmony is effected only in adjacent vowels (= ones in consecutive syllables) or also in arbitrarily distant ones (= ones potentially not in a syllable adjacent to a root).

In the dialect of Qormi, for example, Puech 1978:382-384 reports that rounding harmony spreads from any rounded vowel to any following se-
quence of consecutive underlying short (unrounded) non-low vowels. Thus, e.g., harmony is spread by a rounded root-vowel in 'drank-she-you' = 'she drank you' /ʃurb+it+ek/ → [ʃurb utok] and (already partially derived) 'saved-she-you' = 'she saved you' [sałvu²t+e⁺k] → [sałvu²tok], but it is spread by a rounded suffix-vowel in 'he:wrote-it-to-you' = 'he wrote it to you' /kitb+u⁺w⁺l+ek/ → [kitbu⁺w·lok].

In the dialect of Siğgiewi, on the other hand, Puech shows (pp. 384-386) that the respective corresponding forms are identical [ʃurb utok] and [sałvu²tok] but differing [kitbu⁺w·lek], where a rounded-suffix vowel fails to spread harmony. Furthermore, Siğgiewi rounding "harmony" further differs not only in being triggered by short non-rounded back /a/ in roots, too, but also in being able to apply over non-harmonizing vowels. Thus, e.g., there is long-distance root-triggered harmony in 'drank-we-it:feminine-from-you' = 'we drank (feminine) from you' /ʃurb+nii²+i⁺a⁺l+e⁺k/ → [ʃurbnii²lok] (vs. corresponding Qormi [ʃurbnii²lek]), where the first intervening /i⁺a/ has been shortened to [i], a potential target of rounding harmony. An even more convincing example is Siğgiewi 'drank:he-them-from-them' = 'he drank them from them' /ʃurb+um⁺l+e⁺m/ → [ʃurb um ·lom]. In this form, the rounding of the final suffix-vowel must be long-distance root-triggered because the vowel in the third-person-plural marker -um (a "victim" here of vacuously applied harmony) is invariably rounded in internal position and does not, as in Qormi, itself trigger rounding harmony; compare Siğgiewi 'he:wrote-them-to-them' = 'he wrote them to them' /kitib+um⁺l+e⁺m/ → [kitib um ·lem] with corresponding Qormi [kitib um ·lom].

Based on such data, Puech 1978:383 [(67)], 385 [(100)] formulates roughly the following vowel-harmony rules for the two dialects in question,
where (7) is the iterative, adjacency-based process of Qomri and (8) is the simultaneous, long-distance process of Siqgiiewi:

\[
(7) \begin{bmatrix}
V \\
-long \\
-low \\
\end{bmatrix} \rightarrow [+\text{round}] / \begin{bmatrix}
V \\
+\text{round}
\end{bmatrix} C_0
\]

\[
(8) \begin{bmatrix}
V \\
-long \\
-low \\
\end{bmatrix} \rightarrow [+\text{round}] / \begin{bmatrix}
+\text{ROOT} \\
+\text{back} \\
+\text{round} \\
-long
\end{bmatrix} X
\]

In Maltese, then, there has been a split in what presumably was once the same process for all varieties: that is, an originally phonetic and now phonological vowel-harmony rule still found in one group of dialects is now a morpholexical rule in another group of dialects. And, strikingly, when the latter dialects reanalyzed the rounding rule as morpholexical, they extended its range of possible applications and so allowed it to violate the Weaker Crossover Condition.

Furthermore, according to Puech 1978, there is absolutely no mixing of rule types in Maltese--no intermingling of the conditions governing the two types of vowel harmony rules. Most importantly, no dialects combine control of vowel harmony by any vowel (in either root or suffix) with long-distance harmonization. Thus, if the harmony rule in a dialect is phonologically conditioned, then it always obeys the Weaker Crossover Condition. In this Maltese case, therefore, we have practically a minimal pair showing how the rule-typological property of morphologicality is tightly linked with the relevance vs. non-relevance of a logically independent condition on rule application.

The last three examples have thus shown, then, that the Weaker Cross-
over Condition likewise differentiates rule types—and in the same manner as the previously discussed constraint on syllable-totaling rules (cf. the last section, V.1). That is, phonetic and phonological rules are subject to the Condition, but morphological rules (and presumably also lexical-correspondence ones) are not. Given a synchronic rule typology, the Weaker Crossover Condition aids in the construction of a more coherent picture of sound structure. Without such a typology, on the other hand, the Condition could at best seem a random tendency.

V.2.2. On Optimally Characterizing and Motivating a Crossover-Type Condition for Sound Structure.

Although half a decade has passed since the last spate of work in GP on a Crossover-type condition, this time has brought surprisingly little in the way of new work bearing on such a constraint. The present section is thus limited to a brief discussion of three issues variously relating to the Weaker Crossover Condition: (1) what the strongest version of the Condition is that can be maintained, (2) how the Condition fares vis-à-vis current treatments of vowel harmony, and (3) whether a recent analysis of a dissimilation rule in Akkadian perhaps yields a fourth example which helps to provide additional motivation for the Condition.

As already mentioned earlier, there is actually a whole family of Crossover-type conditions dating from the early '70's. Anderson 1974a, 1975, 1979a--in enlisting support from such a constraint as motivation for a sound-structural rule typology--favored Jensen’s 1974 "Relevancy Condition," since it was and still is the strongest available version of the general principle in question. Nonetheless, to repeat, intervening work mainly by
Odden 1977, 1980 has shown that both Jensen's condition and Howard's 1972a/1972b/1972c "Stronger Crossover Condition" are excessively strong--in that they are falsified by a substantial number of cases based on the application of well-understood phonological rules. Since Odden's arguments have not subsequently been countered, we must conclude that Howard's 1972a/1972b/1972c Weaker Crossover Condition is indeed the strongest form in which this type of constraint can be imposed on phonology (and phonetics).

However, both Jensen's Relevancy Condition and Howard's Weaker Crossover Condition prohibit the target and trigger of a phonological rule from being separated by another potential target. As such, they seem to predict that phonological vowel-harmony which may apparently operate over so-called "neutral vowels" (as in, e.g., Finnish and Hungarian) could not be described in segmental, assimilatory terms (i.e., non-autosegmentally and non-metrically) without violating those constraints. This is because--as vowels--neutral vowels would seem to be at least potential targets of a vowel harmony rule, and yet many segmentally expressed harmony rules appear to allow such potential other targets to separate their focal and determinant vowels. Since the rudimentary progress made by Auto-segmental-Phonological treatments of vowel harmony during the late 1970's forced Anderson 1980a:19-21 to reject such approaches in favor of iterating segmental assimilation-rules, that author further concluded that vowel harmony just does not obey the Relevancy or Crossover Conditions (and/or that those conditions are "in need of further refinement").

During the 1980's, nevertheless, the flood of analyses for vowel harmony proposed within the framework of Multilinear Phonology (i.e., especially...
Autosegmental Phonology but also Metrical Phonology; cf. the references given in Appendix II above) has yielded a whole host of ways to treat neutral vowels without violating Jensen's Relevancy Condition or--more importantly for our present purposes--Howard's Weaker Crossover Condition. While such proposals remain controversial, their essence is that the multilinearity of recent phonologizing allows one as a matter of course to do more than place just vowels and consonants on separate tiers--cf., e.g., McCarthy 1984-MS, 1986 on (non-Semitic) Rotuman (mentioned in Chapter I above), though see Steriade 1986a for a more constrained view. Rather, one can also place different vowels on different autosegmental tiers.

Thus, in the analysis of Vago 1985 (and other works cited there), neutral vowels in languages with vocalic harmony processes can be placed on a separate tier, so that the spreading of harmonic features which apparently propagates over (or through) such segments--from non-neutral vowels to other non-neutral vowels--actually involves just run-of-the-mill spreading between adjacent elements on another tier.

Furthermore, as further pointed out in his survey by Vago 1985, there are other Multilinear Phonological analyses which likewise address the problem of neutral vowels in harmony systems without violating the Relevancy or Weaker Crossover Conditions: e.g., some employing the default rules and incompletely specified lexical representations of Kiparsky's 1982a, 1982b Lexical Morphology and Phonology (LMP), others employing Metrical-Phonological trees and Vergnaud's 1977 notion of "projection" (sometimes even supplemented with a device of "casting out" certain projected vowels, as in Halle and Vergnaud 1981). One can also imagine yet another autosegmental approach in which neutral vowels (or at least their
relevant features) are on the same tier as non-neutral vowels—and are pre-linked there—but trigger a rule "cloning" to their right a floating copy of the nearest autosegment on their left, if there is one. (If a neutral vowel has no autosegment to its right or left, then its own prelinked features may spread.)

Given all of these analytical possibilities, it seems safe to say that neutral vowels in harmony systems probably do not violate the Weaker Cross-over Condition which is the topic of this section of the present work—or, for that matter, the Relevancy Condition. There are, that is, indeed no known valid examples of purely phonological rules which violate those two conditions. On the other hand, though, the existence and current frequency of such Multilinear-Phonological mechanisms as multiple tiers, projections, and the like makes one wonder whether it is not now in fact also possible to reformulate any morpholexical rule which superficially appears to violate Howard’s and Jensen’s constraints in such a manner that it does not actually do so. (Recall that the overall contention of this section is that phonetic rules and phonological rules proper obey those conditions, while morpholexical rules do not.) If this is the case, then those restrictions will have effectively been reduced to vacuity, and we will thereby have lost one of the six proposed conditions on sound-structural processes which are here (mainly after the work of Anderson) being claimed to validate the present quadripartite typology of phonetic, purely phonological, morphological, and lexical-correspondence rules.

Although the previously mentioned long-distance morpholexical rules of spreading-like Accent Ablaut in Acoma (= (5) above; see also Footnote 4 below) and assimilatory vowel-harmony in Siggiewi Maltese (= (8) above) may indeed be subject to exactly such Multilinear-Phonological reanalysis
as non-violative of the Weaker Crossover Condition (as well as the Relevance Condition), it fortunately appears that this is not the case for the dissimilatory process of /r/ → [d] in Abkhaz/Abaza (\(=\) (6) above). In addition, another morpho-lexical dissimilation-rule has recently been proposed which likewise violates Howard's (and Jensen's) constraints and yet seems not to be legitimately reformulable in non-violative Multilinear-Phonological terms.

The process in question is found in Akkadian (already once briefly mentioned here in Chapter I above) and has recently been discussed by McCarthy 1979:228-229/1982a:126-127 [(8)], 1981:381 [(8)]. In that language, there is a nominal prefix (or "preformative") \(\text{ma-}\) which appears before stems in words like \(\text{mazuukt} '\text{mortar}'\). The underlyingly labial nasal of this prefix (but not of parallel \(\text{mu-}\)) is dissimilated to alveolar \(\text{n}\), however, before any stem whose root contains a labial segment (i.e., consonant) anywhere in it. (This dissimilatory rule is sometimes referred to as "Barth's Law", due to its apparent discovery by Barth 1887.) Thus, for instance, an \(\text{n}\)-initial nominal-prefix allomorph appears in words like \(\text{naphar} '\text{totality}', \text{neereb} '\text{entrance}'\) (exemplifying another frequent Akkadian change, whereby \(\text{a}<\text{a} > \text{e}<\text{e} > \underline{\text{r}}\)), and \(\text{narkabt} '\text{chariot}'\). No dissimilation takes place, though, if the only labial segment following the nominal prefix \(\text{ma-}\) is a non-root stem-consonant, such as, in \(\text{maskattum} '\text{deposit}'\) and \(\text{meriitum} '\text{pasture}'\), a suffixal \(\text{m}\) (of "mimation", following a case desinence). In similar fashion, the previously cited form \(\text{mazuukt}\) shows that non-root labial vowels in a stem also are insufficient in themselves to trigger \(\text{ma-}\) dissimilation in Akkadian.

This dissimilatory replacement of \(\text{m}\) by \(\text{n}\) in only one prefix of Akkadian is thus clearly a morphologically conditioned operation--and, therefore,
within the present typology of sound-structural rules, a morphological process. Roughly following McCarthy's 1981:381 [(8)] version employing an essential variable (but cf. also 1979:229/1982a:127 [(8)]), the rule in question can be reformulated as below:

$$
(9) \quad \begin{array}{c}
\text{[+NOMINAL]} \\
\text{[+ROOT]} \\
\text{X[+labial]} Y \\
1 \\
2 \\
\Rightarrow n 2
\end{array}
$$

Like its Abkhaz/Abaza counterpart discussed above, Akkadian ma- dissimilation is here formally stated using an essential variable because other segments may intervene between target and trigger without blocking rule application. And, among such intervening segments, there may thus be further potential phonological targets of the rule. This is in fact the case given either the usual generative convention that the longest string out of a set of strings expanded from an abbreviatory symbol is ordered first or the alternative, McCawleyan convention--here argued for in Appendix IV above--that rules containing notational devices represent unitary processes which express a simultaneous set of possible operations, only the most specific of which is interpreted as applying to any particular form.

Hence, for example, the dissimilation of the prefix ma- to na- seen in the Akkadian word nambau 'source; spring' (cited by Delitzsch 1889: 172) must be analyzed as triggered by the agency of the root-medial labial b operating over the root-initial m, which is phonologically (though not, it is true, morphologically) an appropriate focus for the rule. (The root form in question--/mb'/--seems to have arisen via somewhat idiosyncratic sound changes, given its apparent cognition with the semantically overlapping
Classical Arabic form b u 'b u'. It is in this sense that Akkadian ma dissimulation violates the Weaker Crossover Condition (and the Relevancy Condition). Since purely phonological rules are, to repeat, known not to violate this kind of constraint, we therefore now have a greater degree of both general motivation for recognizing at least two types of sound-structural rules (= morpholexical vs. phonetic or purely phonological) and specific motivation for distinguishing those two types on the basis, respectively, of whether or not their rules refer to morphological and/or lexical information.

Such conclusions concerning the overall theory of sound structure in language can then be brought to bear on the particular practical question--mentioned in Chapters I and IV above--of whether there exist "morphologically conditioned phonological rules". For example, it should be pointed out that McCarthy refers to Akkadian ma dissimulation as "a... very interesting phonological rule..., ... a morphologically governed rule of some generality" (1979:228-229/1982a:126-127)--a case "involving morphological conditioning of [a] phonological rule..., [a] rule... restricted to applying in a given morpheme" (1979:226/1982:125) which "must [therefore] refer to... some set of morphological diacritic features" (1981:380). However, McCarthy's position weakens phonological theory by making it impossible to explain why, if Akkadian ma dissimulation is not a morphological but a purely phonological rule, there are no other, clear phonological rules which have a similar property of leapfrogging their potential targets. It is therefore preferable to explain this gap by assigning morphological status to the rule in question--as well as to the abovementioned similar dissipilatory process found in Abkhaz/Abaza. And this in turns lends support to the present claim that all sound-structural rules which mention morpholexical features
are of morpholexical type.

Thus, even though the number of robust cases currently supporting the non-applicability of Howard's 1972a/1972b/1972c Weaker Crossover Condition to morpholexical rules is not great, we nevertheless now have seen a clear and concrete example of how a sound-structural rule typology and the study of the properties which--like the Weaker Crossover Condition--help define and empirically validate it can also perform the relevant and useful further function of simultaneously constraining phonology and morphology. So far, however, we have only grossly bipartitioned sound structure into two superordinate rule-types: phonetic and purely phonological, on the one hand, vs. morpholexical, on the other. It therefore behooves us consider, in the next two sections of this chapter, a pair of additional proposed constraints on sound structural rules which appear to bear out the finer distinction that can be made between phonetic rules and purely phonological rules (which latter in these cases pattern along with morpholexical rules).

V.3. The Alternation Condition.

V.3.0.

A third condition or principle which both governs the grammatical organization of sound structure and also differentiates between rule types is the well-known "Alternation Condition"--or whatever similar condition is either currently standing in for it or else yielding its effects. The relevant type-differentiating effect which is our focus in this overall section of the present work is that the Alternation Condition appears to restrict all sound-structural
rule types except phonetic ones to generalizations which are motivated by sound-structural alternations. Phrasing matters in another way, it can be said that non-alternational considerations like complementary distribution are sufficient evidence to justify only phonetic processes, but not purely phonological, morphological, or lexical-correspondence rules. In this way, the Alternation Condition not only constrains underlying representations but also effectively imposes a restriction on abstractness differentially across the four rule types, thereby validating (part of) the present sound-structural typology.

However, there has been considerable controversy in generative phonology (GP) over exactly how the/an Alternation Condition is to be instantiated and formulated. In particular, such a constraint can be conceived as limiting abstractness primarily in either representations or rules. And, in the latter case, there are at least two ways to restrict rules: in terms of either their form or their operation (= application and/or ordering). Finally, one can always attempt to collapse a principle like the/an Alternation Condition with one or more other principles—and even to derive that kind of constraint from such other generalizations.

Thus, the next section shows how considerations of all the sorts just mentioned have been relevant in the development of the Alternation Condition and its successors within GP. Namely, after originating as a specific restriction on the form of representations, the Alternation Condition has gone on (as the "Revised Alternation Condition" and later the "Strict Cycle Condition") to become first a constraint on inputs to rule applications (eventually just for processes of "cyclic" type) and later a limitation that follows as a derivative consequence of a more general constraint (the already abovemen-
tioned "Elsewhere Condition") governing rule interaction—and it is now even possible to derive a reflex of the Alternation Condition as a similar consequence of a still more general semantic restriction (the "Avoid Synonymy" Principle) which constrains the application of rules via a comparison of their inputs and outputs.

But the following section also discusses whether the "Blocking" function of the Elsewhere Condition can achieve all the desired effects yielded by the original Alternation Condition, concluding that it cannot and that there is therefore a need in sound structure for such an independent Alternation Condition. Furthermore, this specific restriction—which prohibits postlexical-phonological rules of "absolute neutralization"—turns out to distinguish between phonetic and non-phonetic rules even if it is reducible to a general constraint on cognition or on language learning. It must therefore indeed be concluded that phonological theory requires a constraint limiting all sound-structural rules except those of phonetic type to generalizations justified by alternations.

V.3.1. The Evolution in Generative Phonology (GP) of the Alternation Condition and Its Successors as Constraints First on Phonological Abstractness and Later on Rule Application and Interaction.

The "Alternation Condition" (AC) was originally intended as a means to constrain the abstractness primarily of underlying representations (and thus only derivatively that of rules). It is probably most familiar from the treatment along these lines first given it by Kiparsky 1968b/1968c/1973b.

There, Kiparsky was concerned to rule out analyses involving "absolute neutralization": the positing of an underlying distinction (usually in the form
of an underlying segment) which is never realized as such on the surface but merely serves to obviate positing another underlying distinction (usually of rather limited distribution). On the basis of historical considerations—namely, that language phenomena for which absolute-neutralization accounts had been proposed are irreversible, unstable, and unproductive—Kiparsky argued that linguistic/phonological theory should disallow rules of absolute neutralization. And his AC was intended to accomplish exactly this. Kiparsky 1968b/1986c/1973b:18 thus proposed that, "if a form appears in a constant [phonetic] shape, [then] its underlying representation is that shape.... ...[M]orphemes which are always phonetically identical must have the same underlying representations."

The essential thrust of these proposals is that rules require justification in the form of surface alternations. Thus, if, e.g., Sanskrit has no [e] ~ [a] alternations (and in fact has surface [e] only from underlying /ai/), then the AC prohibits one from proposing for Sanskrit underlying /e/'s and a rule of /e/ → [a] which in essence singlehandedly eliminates all of those /e/'s. Exactly such a rule had earlier been proposed in GP, however, in order to possibililitate an analysis where the otherwise unpredictable distribution in Sanskrit of [k] vs. [c] before [a] was rationalized via derivation of [c] from /k/ by means of a palatalization rule applying before /e/. Here, the /e/'s—once they had served their purpose in triggering palatalization—could then be neutralized with /a/ as [a] (whereby this synchronic analysis recapitulates a historically real sequence of sound changes in (pre-)Sanskrit). Such a "diacritic use of phonological features", though, is prohibited by Kiparsky's condition: a single phonological rule cannot apply to every instance of an underlying segment, since this is exactly the situation in
which no justifying surface-alternation will be visible.

Such a constraint is obviously relevant to the present quadipartite typology of sound-structural rules because, exactly as it has just been formulated, the AC is a restriction mainly on phonological rules. That is, it definitely does not apply to phonetic rules. Morpholexical rules (of both types), on the other hand, most probably do fall under the AC, although I believe (without being able to cite any actual statements from the literature beyond one clearly speculative remark in Anderson 1975:42) that the AC has occasionally been claimed either not to apply to or else to be meaningless vis-à-vis morphological and particularly lexical-correspondence rules (whose unnaturalness/abstractness is, as mentioned in Chapter IV above, practically unlimited).

Nevertheless, the essence of lexical correspondences lies precisely in isolated but nevertheless perceived patterns of allomorphy, and the phonological relations involved are in fact always of a direct sort not mediated by any "third-party" underlying representation(s). For example, the previously mentioned unique (morpho)lexical relationship between Quixote and quixotic in English is expressed directly by the two correspondences k ~ kw and h ~ ks. Similarly, productive morphological rules require justification for their existence and for their particular phonological substance at least from alternations involving Ø. For morphological deletions, replacements, and permutations, of course, justificatory alternations are even more clearly necessary.

In any case, though, it is actually quite easy to establish that phonetic rules violate the AC (both in the original form quoted above and, as we shall see presently, in any of its various proposed revisions). Thus, English aspi-
ration may apply to all instances of some morpheme containing a syllable-initial voiceless stop (e.g., pizza /ˈpɪtsə/ → ['pʰɪtsə]). English vowel nasalization may likewise apply to a form without ever creating any alternations (as in, e.g., lunch /lʌnʧ/ → [lʌnʧ]). And--not to exclude other languages--the intervocalic spirantization of Spanish voiced stops may apply to all instances of a morpheme like haba 'bean' (/aba/ → ['aβa]) and thus not give rise to any alternations. But of course Kiparsky 1968b/1968c/1973a:18 had already recognized this exceptionality of phonetic processes vis-à-vis the AC and therefore built it right into the original formulation of his condition. Thus, one of the ellipses in the quotation from Kiparsky given above stands for the qualification that the AC holds "... except for ... low-level, automatic phonetic processes."

Kiparsky 1973c/1973d/1976 later reformulated the AC, however. The constraint had originally in effect stipulated (as repeated in 1973c/1973d:65 [(2-3)]/1976:167 [(2)]) that "...[n]eutralization processes cannot apply to all occurrences of a morpheme...[=] a limitation on underlying forms... prohibiting (or making costly) the choice of such underlying forms as would involve setting up distinctions never realized on the surface." But Kiparsky 1973c/1973d:65 [(2-4)]/1976:167 [(3)] then converted this principle into a "Revised Alternation Condition" [(RAC)]--"... a limitation on the application of phonological rules...[. Thus, n]eutralization processes apply only to derived forms...[---]that is, ... only if ... their input involves crucially a sequence which arises in morpheme combinations or through the application of phonological processes. Otherwise, i.e., if the environment is met already in the underlying representation of a single morpheme, ... such processes cannot apply. Requiring that a neutralization process apply only to derived envi-
environments guarantees that neutralization will always be contextual (as opposed to absolute)." Again, though, Kiparsky's 1973c/1973d:67 [(2-6)]/1976:167 [(4)] formulation of the RAC excluded phonetic rules from its domain of validity--by requiring application to derived forms only for "...[n]on-automatic neutralization processes", whereas phonetic rules are automatic and by definition non-neutralizing.

Anderson 198077-78/1981:531 (cf. also the references there) has responded to this claim by arguing that there is at least one non-automatic phonological neutralization-rule which violates the RAC by applying in non-derived environments--in fact, mainly there--but which obeys the AC precisely because it does not apply in the relevant derived environments and thereby creates alternations. The process in question is a Faroese rule deleting intervocalic /d, g/. However, the only evidence which Anderson cites as proof for the non-automaticity of the Faroese process--the fact that "it has exceptions in a few words like sýnagoga ... 'synagogue'"--in fact involves what is transparently an uncommon recent borrowing, and so further evidence is required in order to establish that the rule does in fact have exceptions in native vocabulary. If Faroese intervocalic /g, d/ deletion in fact turns out to have no such exceptions, then it will not counterexemplify the RAC. (This conclusion will also hold for Kiparsky's 1982a, 1982b Lexical Morphology and Phonology (LMP) as long as the rule can also be shown to have exclusively the further properties of postlexical rules.)

Still more recent discussions by both Kiparsky and other linguists have suggested further reformulations of the (R)AC, including especially attempts to derive its (desired) effects from other principles. (For up-to-date summaries with references, see Anderson 1980:76-77/1981a:530-531 and espe-
1978/1979, for example, suggested that the constraint in question applies
only to "cyclic" rules (in a somewhat non-traditional use of the term "cyclic"),
Mascaro (1976/1978:34-40) in particular reducing the (R)AC to his "Strict
Cycle Condition" (SCC). Kiparsky at first adopted the SCC but then later (in
Kiparsky 1982a:136-137 [(10)], 159 et passim/1982b:8-9 [(10)], 46 et pas-
sim) suggested treating lexical items--especially underived ones--as specific
rules ("lexical identity rule[s]"), thus deriving the SCC from the "Elsewhere
Condition" (EC). (The EC has already mentioned here several times above
and will be discussed in detail as the sole of focus of Chapter VII below.)

Finally, Kiparsky 1983 [(22)] has proposed that the EC itself reduces to a
semantic "Avoid Synonymy" principle which "may turn out to be ... a lan-
guage[-]learning strategy [rather] than a formal constraint of grammar":
namely, "...[t]he output of a lexical rule may not be synonymous with an ex-
isting lexical item". (In this, however, Kiparsky seems not to have been
been followed by other scholars--see, e.g., Kaisse and Shaw 1985 and
Anderson 1986:4-5.) Via either of these principles, though, Kiparsky is able
to use a single generalization to derive, not only a condition on abstract-
ness (yielding the effects of the original AC), but also a derived-environ-
ments restriction on rule application (yielding the effects of the RAC) and a
"Blocking" constraint on the interactive application and ordering of morpho-
logical and (some) phonological rules (yielding the effects of an extension
of the original, phonological EC--and claimed to yield the effects of the origi-
nal, as well).

Obviously, the success of an approach which attempts to derive all the
desired consequences of the AC from a more generally interpreted EC de-
pends on the validity of the second constraint. A fuller discussion of this point must, of course, be postponed until later, but the conclusions of Chapter VII which are relevant for our present purposes can be anticipatorily summarized at this juncture. To wit: while the original, phonological Elsewhere Condition turns out to have no counterpart governing pairs of lexically free morphological rules, the "Blocking" of lexically free generalizations by lexically limited ones is indeed a valid principle of sound-structure (although it does not actually require one to view lexically listed items themselves as rules, as in LMP). Such "Lexical Precedence and Disjunctivity" is thus perhaps a separate principle distinct from the original, phonological EC, but it can also be seen as being part of the same principle—that part, namely, which governs lexical-correspondence rules.

Given the validity of at least the EC's "Blocking" aspect as a sound-structural principle, it must be concluded that such a constraint is at a minimum potentially available as a successor of—and even replacement for—the AC. It therefore behooves us to consider, first, whether the EC/"Blocking" has the same bearing on the present rule typology as the AC does and, second, which of the two principles is (more) correct in cases where they yield different predictions.

V.3.2. On the Continued Need for the/an Alternation Condition (AC) as a Constraint on Postlexical-Phonological Neutralization-Rules.

In fact, it turns out that the EC and the AC imposes different restrictions on sound-structure. This is because, in LMP, the EC (and so at least "Blocking") must be defined (cf. Kiparsky 1982a:136-137/1982b:8 [(10)]) in such a way that it governs only "...[r]ules ... in the same component" and so does
not constrain the interaction of postlexical-phonological rules with underlying lexical representations and with the outputs of lexical-phonological rules. In this way, phonetic rules are exempted from the EC/"Blocking", since in LMP the "postlexicon" is the locus of all phonetic rules as defined in the present sound-structural typology (i.e., of all processes manipulating numerical feature-values and/or binary values only of non-distinctive phonological features). For example, Kiparsky 1985:87 states flatly that, "If a certain feature is non-distinctive in a language, ... then it may not be specified in the lexicon[--i.e., it]... may ... [neither] figure in non-derived lexical items... [nor] be introduced by any lexical rule...".

On the other hand, though, LMP also explicitly allows non-phonetic rules in the postlexicon: namely, postlexical-phonological rules of neutralization. This is because, in the words of Kiparsky 1985:87, "there can be postlexical neutralization rules... which must apply across the board"--i.e., in both non-derived and derived environments. Furthermore, these processes can be non-automatic (e.g., Kiparsky 1982a:171/1982b:57 mentions their frequent optionality). Since, on the other hand, the AC and more particularly the RAC are--as above--specifically defined in such a way as to prohibit all non-automatic neutralization rules of phonological type, it is clear that the AC and the EC/"Blocking" do indeed impose different constraints on sound structure. Most importantly, the fact that LMP effectively exempts both phonetic rules and some (postlexical) phonological from the EC/ "Blocking" means that, if the AC is entirely replaced by the EC, then the overall constraint in question no longer distinguishes phonetic rules from all others--and thereby completely loses its former usefulness in confirming the divisions of the present quadripartite sound-structural typology.
Having concluded this, we must now therefore evaluate Kiparsky's 1982a:148-150 et passim/1982b:36-38 et passim implied claim that the original AC can and in fact should be dispensed with entirely because, in comparison with the use of the EC in a "Blocking" function to achieve desired AC effects, the AC by itself suffers from four disadvantages. Given that two of these criticisms seem obviously valid while the other two do not, let us consider the former before the latter.

First, since the EC (or just "Blocking" alone) prevents conflicting general rules of phonology and morphology from applying to (the relevant parts of) lexically listed stems, such a constraint can simultaneously and uniformly explain not only why exceptional lexically listed forms (like English obesity) fail to undergo conflicting general processes (like Trisyllabic Laxing/Shortening) but also why non-exceptional words (like English ene my) cannot have lexical representations which have opposite values from their surface forms and cannot be derived by taking a "free ride" on independently motivated rules (like, again, Trisyllabic Laxing). This is because an analysis of the latter sort effectively involves a conflict between an exceptional lexical representation and a lexically free rule—a situation which falls under the EC (or at least "Blocking"), so that the rule in question cannot apply.

Second, since the EC (or at least "Blocking") prevents rules from applying to non-derived forms, it explains why there are no alternations where a rule applies only in non-derived environments and so never in derived ones. (Such an alternation would be more or less equivalent to the above-mentioned case from Faroese forwarded by Anderson 1980c/1981a but here evaluated as not yet conclusively established.) The AC, on the other hand, predicts—apparently wrongly—that such an alternation pattern could
exist, since the AC merely requires rules to be justified by alternations but
does not indicate what sorts of alternations are required or possible.

The two problems just summarized can, of course, be solved by replac-
ing the AC with the EC/"Blocking". However, since at least the "Blocking"
aspect of the EC is independently motivated by evidence from the interac-
tion of lexical representations and morphological rules, one can also alter-
natively suggest that the AC should not be dropped entirely but instead just
supplemented with the EC/"Blocking". This presupposes, however, both
that the AC has some independent function to fulfill and that it does not
suffer from severe defects in the absolute. We must therefore now consider
Kiparsky's second two criticisms of the AC (either as an alternative to the
EC or--at the present juncture--as a possible supplement to it). To repeat,
though, it turns out that these second two of Kiparsky's criticisms of the AC
vis-à-vis the EC must here be evaluated as invalid. This will lead us to con-
clude here that the AC must be retained as an independent principle--a
principle, however, which exempts phonetic processes. In this way, the AC
differentially constrains the various types of sound-structural rules and so
does help validate the present typology, after all. Kiparsky's second two
criticisms can be summarized as follows.

First, Kiparsky 1982a:4-5, 1982b:37-38 claims that "the ... [AC] is too
strong in that it excludes analyses which are well motivated on internal
grounds. That is, it cannot be maintained without unacceptable loss of gen-
eralization." For example, Kiparsky observes that "...[w]ords ending in -ory
and -ary, as well as words like galaxy... [and] industry, systemati-
cally behave as if the final vowel was really a consonant... with respect to
several ... rules" of English phonology. He argues that this fact justifies both

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an underlying final /y/ in such words and also an obligatory (lexical-phonological) rule of neutralization whereby y → i/__#--which is, after all, a case of contextual rather than absolute neutralization. (This rule is a lexical rather than postlexical one because, in the words of SPE:225, it "must be in the cycle"). But Kiparsky 1985:87-88 goes even farther, claiming that the already abovementioned class of "postlexical neutralisation rules, which must apply across the board[-–is] just the class of 'absolute neutralization' rules which the facts appear to demand."

However, I here wish to maintain that there are no valid absolute-neutralization rules (postlexical or otherwise) demanded by the facts of any human language. Instead, the situation taken by Kiparsky to motivate such rules and the abstract segments that they are intended to allow--one where several phonological processes act as if some surface segment were actually another segment underlyingly--can easily be handled by means of a concrete analysis utilizing the device of redundancy rules defined over rules and rule features. (A specific example of such an account is here provided for Czech vowel alternations in Section VI.7 of the following chapter, where it is also observed that the crucial device in question was in fact proposed by Kiparsky 1968b/1968c/1973a himself.)

Furthermore, Kiparsky 1982a:158/1982b:45 elsewhere in the same work(s) concedes that, "in case after case, obligatory neutralization rules bequeathed to a language by sound changes that merge segments are reanalyzed out of it, and non-derived outputs of obligatory contextual neutralization rules are lexicalized, so that the actual phonologies are practically always more concrete than history would make one expect." Indeed, Kiparsky states that explaining why this happens should be one of the major is-
sues with which the theory of sound structure should concern itself.

However, if language states allegedly having absolute-neutralization rules and other violations of the AC are so evanescent, one can suggest that such situations are far removed from being as simple and elegant as the absolute-neutralization analyses posited for them would suggest. Rather, it seems more likely that linguistic circumstances of the sort in question center around concrete rules encrusted with rule features expressing the "as if" nature of the processes involved--whereby it is the relative complexity embodied by this kind of sound structure which explains why lexicalization and reanalysis tend to iron it out again so soon.

Thus, even if we adopt the essential (other) tenets of LMP, we still apparently require the/an AC as a constraint against rules of absolute neutralization and other types which are not supported by alternations. This--to repeat--is mainly because, in LMP, the EC (and so at least "Blocking") must be defined (cf. Kiparsky 1982a:136-137/1982b:8 [(10)]) in such a way that it governs only "...[r]ules ... in the same component". As a result, postlexical rules in LMP can and do apply to non-derived lexical representations, and so there obviously can be postlexical rules of absolute neutralization--a situation which, in LMP, is apparently desired. Since we have here, however, adduced reasons against allowing such rules in sound structure, we obviously require a specific constraint like the AC for that purpose. (And the AC also does double duty by prohibiting lexical-phonological rules of contextual neutralization like the previously mentioned English rule of word-final -y vocalization, pace Kiparsky.)

A second questionable criticism of the AC made by Kiparsky 1982a:148, 1982b:36 (following the implicit position of Drescher 1980/1981 and the ex-
plicit one of Anderson 1980c:78-83/1981a:531-535) involves the claim that "...[t]he ... [AC] is not interpretable as a formal condition on grammars. In order to check whether it is satisfied in a given grammar, it would be necessary to inspect every derivation of that grammar. The only sense that can be made out of it is as a strategy of language acquisition which says that a language learner analyzes a form at face value unless [(s)]he has encountered variants of it which justify a more remote representation."

However, in attempting to account for why sound-structural rules universally tend to become lexicalized, Kiparsky later in the same work(s) (= on pp. 172 [(78)]/57-58 [(48)]) proposes as his only explanation a "Derivational Simplicity Criterion (DSC)"; "Among alternative maximally simple grammars[, that one is] select[ed] ... which has the shortest derivations." While it is again the "language learner [who] is guided by [such] a principle", Kiparsky's approbation for this constraint--which clearly would require an inspection of every derivation in alternative grammars no less than the AC would--suggests that the AC is also, after all, a workable linguistic principle, even if it is not, strictly speaking, "a formal condition on grammars".

If this were so, then we would have in the AC a language-learning strategy which differentiates between phonetic processes and all other sound-structural rules--or at least has the effect of doing so--by allowing only the former to be posited by learners in the absence of some kind of support from surface alternations in sound structure. Indeed, even if the strategy in question were not a purely linguistic but rather a general cognitive one, it could even be seen as receiving a certain amount of support from the fact that the major considerations which are usually said to govern phonetic rules--complementary distribution and perceived similarity of physical sub-
stance—are often argued to have parallels among the "etic" phenomena found within the numerous non-linguistic domains of culture and general human behavior.

For the above reasons, I thus here conclude that there is an AC, after all, and that, regardless of whether that AC is a specific grammatical principle or a general cognitive one, all non-phonetic sound-structural rules are indeed subject to it. (A similar position has in fact already been independently reached by Iverson and Wheeler 1986—who, however, opt for retention of the RAC, rather than the original AC, as the required principle.)

Before leaving the subject of the AC, however, it is necessary to address more fully (than the brief remarks made in Chapter IV above) the extent to which the traditional distinction in GP between phonological and phonetic rules does or does not correspond to the distinction made in LMP between lexical and post-lexical rules, respectively. As we have already seen, there is one disparity here in that the postlexicon of LMP is intended to contain both phonetic and phonological rules. Again, though, if the latter really are not only "just th[e]... class of 'absolute neutralization' rules" but also invalid (as I have maintained in the present work) and therefore in need of the/an AC which will prohibit them, then the class of LMP's postlexical rules might turn out to be exactly equivalent to the set of phonetic rules in the present sense.

Nevertheless, this conclusion is made unlikely by several further considerations having to do, first, with the status and locus of redundancy rules, second, with the ability of the same rule to apply both lexically and postlexically, and, third, with the existence of the "pre-morphological" phonetic rules seemingly required in the lexicon by the facts of languages like Javanese.
and Rotuman (cf. their brief discussion already here in Chapter I above).

In the first place, we must consider the fact that (purely) phonological rules are defined in the present typology essentially as neutralization rules which categorically manipulate at least one distinctive phonological feature—i.e., a feature which shows underlyingly contrastive values for the segments which undergo it. The lexical underspecification of underlying representations in LMP, however, entails that redundant features receive their surface values via the operation of redundancy rules—which in LMP can be either effectively universal-markedness conventions or else language-particular processes. In Kiparsky's 1982a:169-170/1982b:55-56 analysis of English, for example, the fact that the initial /s/ in sip is voiceless results from a universal default-rule. The latter specifies the unmarked value of all obstruents as voiceless but is prevented by the EC/"Blocking" from altering preexisting feature-values (such as the [+voice] which is lexically specified in the initial segment of English zip but lexically derived in the final segment of pubs).

On the other hand, it is surely a marked peculiarity of English that the default-value of laterals for the features [high] and [back] is [+high, +back]—i.e, velarized—since non-velarized /l/’s have a much more limited distribution. In this case, an English-specific redundancy-rule must provide the necessary feature-specifications.

Since all of the features [voice], [high], and [back] can be underlyingly distinctive in English, both of the redundancy rules just mentioned would be treated by Kiparsky 1982a:loc cit./1982b:loc. cit. as applying within the lexicon. Indeed, "the [most fully specified] lexical entries themselves are the end points of ... hierarchies of successively more specific [redundancy] rules". But, since English voiceless fricatives are in LMP all underlyingly
(lexically) specified as [0\text{voice}], and all laterals as [0\text{high}, 0\text{back}], it turns out that, in LMP, neither of the processes just mentioned functions as a neutralization rule. (This is true even though both rules manipulate phonological features which are usually said to be contrastive for the language in question). Hence it would seem that, within the present sound-structural typology, the two redundancy rules at issue must for English be assigned to the phonetic rule-type--despite the fact that they apply in the lexicon. In this way, it actually appears that the set of phonetic rules in the present sound-structural typology is not, after all, equivalent to the set of postlexical rules in LMP (even when postlexical-phonological rules of absolute neutralization are ruled out as a possibility), since the cases discussed immediately above apparently constitute phonetic rules applying in the lexicon.

Suppose, though, that one were somehow able to argue that the two relevant rules from English sound-structure are not phonetic but instead phonological redundancy-rules. Even this move would not by itself clearly ensure that the set of postlexical rules is equivalent to the set of phonetic rules in the present sense, since Kiparsky 1982b:83 and 1985:92 has explicitly emphasized that there exist not only lexical but also postlexical redundancy-rules.

This is because, according to Kiparsky 1985:92, the lexicon contains a "system ... [of] conditions on what feature values may be marked [(specified) in "lexical representations"; for example, the following]... marking condition ... [not only] prohibits voicing from being [underlyingly] marked on sonorants in the lexicon: ..."[\text{\textalpha}{\text{voiced}}, +\text{son[orant]}][--but... also blocks the redundant specification [+\text{\textalpha}{\text{voiced}}] from being assigned to sonorants in lexical derivations."

(Kiparsky 1985:loc. cit. calls this principle "Structure Preservation":

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"marking conditions must be applicable not only to undervived lexical representations but also to derived lexical representations, including the output of word-level rules." As a result, redundancy rules which manipulate features that are always non-distinctive in a language must be postlexical. And so, if all redundancy rules are phonological, then some non-neutralizing phonological rules must be postlexical.

Consequently, the only way for LMP even to attempt to ensure that all and only phonetic processes are postlexical would be to define phonological rules in such a way that they necessarily involve, not neutralization of an underlying contrast, but rather categorical manipulation of at least one feature which is distinctively specified (as "+" or "-" but not 0) somewhere in underlying representation—even if not for the segments which undergo the rule in question. This move would then for English differentiate, e.g., the first redundancy-rules discussed above (for voicelessness of /s/) from the second one mentioned there (for voicing of sonorants), distinguishing them as phonological vs. phonetic in exactly the same way as the present sound-structural rule typology.

Nonetheless, a second relevant consideration in the present regard is that Kiparsky 1985:85 has recently claimed that "the same rule... [may] apply both lexically and postlexically", largely because "it is possible to treat a lexical and a postlexical process as a single rule in spite of radical differences in mode and scope of application" (p. 87). That is, the set of postlexical phonological rules contains not only one-time absolute neutralizations of a controversial nature but also contextual neutralizations which, in addition, apply lexically—e.g., the English voicing-assimilation rule that affects not only lexically added inflectional affixes like plural /-z/ but also (in Kiparsky's
view) postlexically added clitics like reduced /-(ɨz)/. Kiparsky 1985:94 thus suggests that "...[t]here are two different types of postlexical rules [...] essentially phonetic[,] ...gradient[,] and variable [vs.] truly phonological[, although] ... the distinction ... is by no means clear-cut."

From this, it follows that the sets of postlexical and phonetic rules in sound structure are definitely not coextensive. As a result, linguistic theory must—as in the present typology—recognize and define a specific phonetic rule-type in order to impose any restrictions which differentially affect such processes vis-à-vis those of other types. Here, I have suggested that the AC is a constraint of exactly this kind, since it prohibits rules of absolute neutralization among all sound-structural processes except those of phonetic type.

Third and finally, though, it should briefly be mentioned here that yet further support for the independence of the phonetic/non-phonetic vs. lexical/postlexical distinctions comes from the fact that, in addition to phonological rules in the postlexicon, there indeed exist phonetic rules in the lexicon, after all. This follows mainly from the fact that, in LMP, all morphological rules are lexical; none are postlexical. Recall that, in Chapter I of the present work, it was mentioned that the morphological rules which mark the incomplete phase in Rotuman and the elative category of Javanese must be preceded by phonetic rules. Consequently, these phonetic rules must also be lexical. As discussed by Janda 1984, Hoeksema and Janda, and references there, the three Rotuman phonetic rules of Raising, Fronting, and Backing must be pre-morphological. And, for Javanese, Dudas 1974, 1976: 180-201 shows that the morphological replacement-rule of elative formation must follow the three phonetic rules of High Vowel Laxing, Mid Vowel Lax-
ing "1" (= in closed stem-final syllables), and Mid Vowel Harmony (cf. Dudas 1976:59, 85, 91, respectively).6

However, these examples all deserve far more individual discussion than can be accorded them here--especially Javanese elative formation, which also interacts with a phonological rule which is likewise clearly pre-morphological and hence lexical but seems to apply to underived forms in the lexicon. I will here therefore only observe that the existence of phonetic rules in the lexicon provides a final piece of further support for the position taken by this work that, if phonetic rules are to be recognized as constituting a separate sound-structural type, then that type must be defined in terms of its rules' numerical form and/or non-neutralizing function, not on the basis of their location at some particular place within sound structure. And the necessity of distinguishing phonetic rules as an individual rule type has in this section been forthcoming from the range of facts connected with the Alternation Condition (AC).

To sum up in brief, I have argued that the primary function of the earliest AC--to prohibit phonological rules of absolute neutralization (and certain ones of contextual neutralization)--has not been preserved across all the various revisions of Kiparsky's original AC, such as his own Revised Alternation Condition (RAC), Mascaro's Strict Cycle Condition (SSC), Kiparsky's extension of his earlier Elsewhere Condition (EC) as a "Blocking" constraint, and his "Avoid Synonymy" Principle. Thus, it is true that these principles--especially the EC/"Blocking"--by now perform several necessary and independently motivated functions: e.g., limiting lexical-phonological rule application to derived environments, guaranteeing strict cyclicity, and ensuring the proper interaction of phonological and morphological rules with
lexically limited generalizations. But there is still a need for the/a AC as a separate restriction—even if it should turn out to be a language-learning strategy or a general cognitive constraint.

And, since it imposes the requirement that all rules of sound structure except phonetic ones must be justified with reference to alternations, the AC supports the present rule typology by validating one of its rule types. Thus, we have yet again validated a proposed aspect of grammar that not only helps motivates our sound-structural rule typology but can also be used when we are unsure about either the proper formulation of rules or just about their assignment to a particular type. That is, for example, if a rule applies validly to all instances of a morpheme without any resulting alternation(s), then it must be a phonetic rule. But, as shown by the next section, the AC is not the only proposed condition on sound structure which isolates rules of phonetic type.


V.4.0. A fourth condition illustrating the need for phonological theory to distinguish various types of sound-structural rules from one another relates to so-called "mirror image rules." Mirror image rules exist—as schemata—in order to express generalizations such as that a given process occurs when its input segment is "next to" another segment (either before or after), or when it is between two groups of segments of a specified nature (regardless of their order). Bach 1968 pointed out that the existing notation of generative phonology (GP) could not express such generalizations as the first type just
mentioned, since it always required an environment bar in phonological rules. Hence, the environment "adjacent to X" could (at the time when Bach was writing) be expressed only as "/{ __ X, X __}". Bach therefore proposed that the environment bar be omissible in such cases, this move thereby expressing the above disjunction as a rule schema: "/X". Soon afterward, Langacker 1969 presented further phonological arguments in favor of such mirror image rules. (These rules are so named because, in "/{ __ X, X __}", etc., the environments are mirror images of each other. Earlier, though, Bach 1968 had used the term "neighborhood rules" similarly, for obvious reasons).

Anderson 1969b/1971, 1974c determined however, that there exist mirror image processes of the second type mentioned above, where both sides of the environment are relevant. This situation is of such a nature that Bach's notation cannot express it, since omitting the environment bar from, e.g., "/{X __ Y, Y __ X}" yields "/XY", which is three-ways ambiguous between the foregoing disjunction and the two further ones "/{XY __, __ XY}" and "/{__ XY, YX __}". Consequently, Anderson suggested that "/{ __ X, X __}" and "/{X __ Y, Y __ X}" be abbreviated as "%__ X" and "%X __ Y", respectively. Anderson further argued that, sometimes, the order of expansion for the environments of subrules in a mirror image schema is crucial, so that one must further establish a convention that the environment listed in the collapsed statement of a mirror image process determines that rule schema's first manner of application. Thus, for example, in a rule with the environment "%__ X", the subrule with the environment "/__ X" applies before the subrule with the environment "/X __".7
V.1. Previous Work in Generative Phonology (GP) on Conjunctivity and
Disjunctivity in Mirror-Image Rule-Schemata.

The relevance of mirror image rules for a typology of sound-structural
rules, however, comes from Anderson’s 1969b/1971, 1972b, 1974a, 1974c
claims regarding whether there is conjunctive or disjunctive ordering of
rules properly sequenced—as above—in mirror image schemata, since this
seems to differ between rule types. That is, Anderson has argued that con-
junctive ordering of mirror image subrules holds for all and only phonetic
mirror-image schemata, while disjunctive ordering of mirror image subrules
holds for all and only phonological mirror-image schemata.8

To illustrate this, I will next present one example of a phonetic mirror-
image rule and one example of a phonological mirror-image rule. I will
thereby demonstrate that, if their subrules are applied sequentially, the
processes in question produce correct results only if the phonetic one oper-
ates conjunctively but the phonological one operates disjunctively. (For a
much fuller discussion of mirror image rules along these lines, though, cf.
and references there.) In the present section of this overall discussion of
mirror image rules, I will be following the more usual assumption in GP that
rule schemata are derivative constructs abbreviating sets of primitive rules.
In the following section, however, I will discuss the possibility of treating
even mirror-image rule schemata as single primitive rules, as already advo-
cated in Appendix IV above.

As pointed out by Anderson 1969b/1971:96-97, 1974c:118-119, a pho-
netic mirror-image schema can be motivated for the Mayan language Chon-
tal. As described by Keller 1959:45, laryngealization in this language is not
distinctive for vowels. Nevertheless, "...[v]owels contiguous to glottalized consonants, glottal stop, or the allophone of the phoneme [/]b [/] which has glottal quality[-cf. p. 46: "the phoneme [/]b [/] when ... syllable[-]final[/]... is voiceless with superimposed glottal closure"--...may be laryngealized".

Thus, Keller's account makes it seem that, in Chontal, both /taʔ/ 'excrement' and /caɒk/ 'flea', for example, may be pronounced with laryngealized vowels. From Keller's later remarks (quoted further below), it is clear that the degree of laryngealization involved varies systematically, and so this whole process may be expressed as an optional mirror-image rule of phonetic type.

If we represent laryngealization with the feature [glottal constriction] (abbreviated "[gl. constr.]") and arbitrarily assume (with Anderson 1974c: 119) that the amount of optional laryngealization added to Chontal vowels by the process just described can be quantified as [.4 gl. constr.], then we can write the required rule as follows:

\[
(10) \left[ \text{x gl. constr.} \right] \rightarrow \left[ \text{x + .4 gl.} \right] [+ \text{gl. constr.}] \\
\]

Here, "x" is a variable standing for the original degree of laryngealization, whatever it is (=, for most vowels, 0), and the order of the environments (when the schema is expanded into its two subrules) is essentially arbitrary. The rule just given abbreviates the following two subrules:

\[
(11) \left[ \text{x gl. constr.} \right] \rightarrow \left[ \text{x + .4 gl.} \right] [+ \text{gl. constr.}] \\
\]

\[
(12) \left[ \text{x gl. constr.} \right] \rightarrow \left[ \text{x + .4 gl.} \right] [+ \text{gl. constr.}] \\
\]

The above mirror-image rule schema (10) collapsing the two subrules (11) and (12) will thus correctly laryngealize all the proper vowels (e.g.,

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those in the forms given earlier). The important thing about Chontal vowel laryngealization, though, is that (according to Keller 1959:45), "laryngealization is more pronounced between two ... [glottal(ized)] consonants[--as, e.g., (twice) in /]ʔ u kʰəʔ nán[/ =] [ʔ u kʰəʔ nán]... [']it gets ripe...['"than ... contiguous to just one", as in the two forms cited further above]."

This brings out the reason for using "x" in the above rule schema and also for treating laryngealization of vowels as a matter of degree. In a form like the one just given, the two vowels sandwiched between a pair of glottal-ized) segments are presumably twice as laryngealized as they would have been if adjacent to only one glottal(ized) segment. This fact can be captured by analyzing the vowels in question as undergoing both subrules of the laryngealizing mirror-image schema earlier formalized as (10), so that they end up as [.8 gl. constr.]. But this then obviously requires conjunctive ordering for the subrules of the phonetic process in question.

In a recent stage of the West Scandinavian (North Germanic) language Faroese, on the other hand (as analyzed by Anderson 1969b/1971:57-59, 92-94, 1972a:6-8, 1974c:113-115, 168-173, 255-256, 314--but cf. Hellberg 1980 and his references), there is a phonological mirror-image rule which requires disjunctive ordering of its subrules if they are sequentially applied. According to Anderson 1974c, "...[i]n Faroese, whenever two ["heterosyllabic" (cf. p. 256)] vowels (or diphthongs) come together...[--]either directly through affixation... or through the deletion of an intervocalic consonant... [--] a glide is inserted whose character is determined by the surrounding vowels" (p. 113). "[(]The [v] glides ... inserted before [u] ... are turned into [v] by the operation of an independently needed rule which need not concern us[])..." (pp. 113-114). "...[T]he inserted glide is homorganic with the preced-
ing segment, regardless of the following, if the preceding segment is [+high]; if the preceding segment is [-high], ... [the inserted glide] is homor-
organic with the following segment, if that is [+high]...[,] and if neither preced-
ed nor followed by a high vowel or glide, the hiatus is not broken by any

glide" (p. 114).

Thus, for example, heterosyllabic /...ia.../ and /...ua.../ become
[...ija...] and [...uva...], respectively; /...ai.../ and /...au.../ become [...aji...]
and [...avu...], respectively, but /...ao.../ and /...ae.../ remain [...ao...] and
[...ae...], respectively. Following Anderson 1974c:115 [(15)], 256 [(1)], the
Faroese process at issue here can be described with the following mirror
image rule (in which "$ = syllable boundary":

\[
(13) \quad \emptyset \to \begin{array}{c}
\text{-vocalic} \\
\text{-consonantal} \\
\text{+sonorant} \\
\text{+high} \\
\end{array}
\begin{array}{c}
\% \text{-consonantal} \\
\text{+high} \\
\text{+high} \\
\end{array}
\begin{array}{c}
\text{a back} \\
\text{a back} \\
\end{array}
\begin{array}{c}
\text{$...[-consonantal]} \\
\\end{array}
\]

This schema abbreviates the two subrules given below:

\[
(14) \quad \emptyset \to \begin{array}{c}
\text{-vocalic} \\
\text{-consonantal} \\
\text{+sonorant} \\
\text{+high} \\
\end{array}
\begin{array}{c}
\% \text{-consonantal} \\
\text{+high} \\
\text{+high} \\
\end{array}
\begin{array}{c}
\text{a back} \\
\text{a back} \\
\end{array}
\begin{array}{c}
\text{$...[-consonantal]} \\
\\end{array}
\]

\[
(15) \quad \emptyset \to \begin{array}{c}
\text{-vocalic} \\
\text{-consonantal} \\
\text{+sonorant} \\
\text{+high} \\
\end{array}
\begin{array}{c}
\% \text{-consonantal} \\
\text{+high} \\
\text{+high} \\
\end{array}
\begin{array}{c}
\text{a back} \\
\end{array}
\begin{array}{c}
\text{$...[-consonantal]} \\
\end{array}
\]

For the hiatus configurations cited earlier, sequential application of
these rules will produce the correct outputs regardless of whether they are
ordered conjunctively or disjunctively--since, in such cases as those, only
one (or neither) of the two subrules can apply. However, when there are
heterosyllabic configurations like /...iu.../ and /...ui.../, both subrules potentially could apply, and it is thus possible to determine from the required (actual) output whether the mirror-image rule-schema in question sequentially applies disjunctively or conjunctively. In fact, the configurations just mentioned become [...iju...] and [...uvi...], respectively—*[^...ijju...] and *[^...uvvi]. Clearly, then, only one subpart of the schema should be allowed to apply, and so the subrules of this phonological mirror-image rule of Faroese must apply disjunctively—as opposed to the conjunctively applied subrules in Chontal’s phonetic mirror-image rule.

Anderson 1974c:110-123 [(8)] interprets further parallel examples involving sequential application within schemata of the phonetic and phonological rule-types as indicating that the association of phonetic mirror-image rules with conjunctive ordering and of phonological ones with disjunctive ordering is not just a fact about the grammars of Faroese and Mayan but rather a generalization about the mirror image rules of all languages that have them. For example, Anderson claims that disjunctively ordered phonological mirror-image rules are also found in (at least) Acoma (again cf. Miller 1965) and Oscan (a member of the Osco-Umbrian group of the Italic branch of Indo-European—cf. Buck 1904), while Anderson 1969b/1971:94-96 had already proposed an example of the same kind for Old Breton. And conjunctively ordered phonetic mirror-image rules are also present in (at least) Modern Breton (Brythonic Celtic—cf. Falchun 1951), Old Irish (Goidelic Celtic—cf. Thurneysen 1909/1946), Ubykh (Northwest Caucasian—cf. Dumézil 1931, 1957-1958, 1959, Vogt 1963, and Dumézil 1965), and probably also Modern Russian (cf., e.g., Anderson 1974c:120).

Once again, then, it seems that a significant condition governing the ap-
plication/ordering of sound-structural rules makes reference to rule types. Since disjunctive ordering is generally felt to be a marked one, relative to conjunctive order, it makes sense to regard the apparent requirement of disjunctive ordering for phonological mirror-image rules as a special condition on rules of that type alone. The seeming conjunctivity of phonetic mirror-image rules, on the other hand, follows simply from the fact that no special dispensation/requirement exists that they may/must operate disjunctively--so that phonetic mirror-image rules are conjunctive by default, as it were. On the other hand, I know of no proposed examples of mirror-image morpho-lexical rules in the literature on GP; at present, they thus seem to exist only as a logical possibility. Still, because of the greater restrictiveness of such a move, I will here provisionally assume that the morphological and lexical-correspondence rule-types are subject to an apparent constraint which requires them to operate disjunctively if they are sequentially applied mirror-image rule schemata, since this makes for fewer rule-applications and hence for shorter dervations.

In any case, though, the seeming necessity of stipulating disjunctivity for phonological and morpho-lexical mirror-image rules thus means that sound-structural theory must apparently recognize their joint typological distinctness from the class of phonetic rules--which the constraint in question thereby isolates, just as the Alternation Condition does. Here, too, something follows from the present rule-typology for sound structure. And, of course, once we have convincingly established a set of type-related correlations like that involving mirror-image rules, we can then use them again in order to determine type membership for rules of which we are otherwise unsure: e.g., a borderline phonetic/phonological rule that is apparently a con-
junctive mirror-image schema can seemingly be only phonetic, after all.


In the previous section, it was assumed that both phonetic and phonological mirror-image processes are rule schemata whose subrules apply sequentially, and on this basis a determination was then made that, for such rules, phonetic status seems to correlate with conjunctive ordering, while phonological status correlates with disjunctive ordering. However, Appendix IV immediately preceding the current chapter presented arguments that rules containing the notational devices of GP should be interpreted as unitary, single rules rather than as rule schemata which abbreviate their subrules. Since mirror image rules (of whatever type) involve one of the notational devices of GP, it should follow from the preceding that such processes can be interpreted as having parts which all apply simultaneously, rather than as having individual subrules which apply in sequence. And, indeed, it turns out that at least the phonetic mirror-image rules discussed here earlier are no less workable when treated as having simultaneously applying parts.

For example, the phonetic mirror-image rule of Chontal vowel laryngealization (= (10) above) can be viewed, not as a schema, but instead as a single rule that just happens to be subject to two alternative environments of application: namely, before a glottal(ized) segment and after such a segment (corresponding to the two putative schematic subrules given as (11) and (12) above). When either of these environments is satisfied, this licen-
ses the rule's applying so as additionally to laryngealize a vowel to the extent that it becomes \([x+.4 \text{ gl. constr.}]--\text{i.e.,} .4\) more laryngealized. When both environments are satisfied, the rule can be interpreted as adding ".4" more laryngealization twice--for a total of ".8" more laryngealization.

What is obviously required here, then, is that we interpret the simultaneous application of phonetic rules--or at least of their scalar-feature-valued, phonetic-detail-rule subtype--such that their potentially multiple effects on the same location in a phonological string are cumulative (additive and/or subtractive) rather than replacive. But this is in fact exactly the interpretation that has been proposed by Anderson 1969b/1971:96-97, 1974c:118-119--cf., e.g., the previous discussion here of how the putative sequential sub-rules of Chontal vowel laryngealization must apply.

In a sense, really, this additive mode of application should probably be seen as constituting part of the definition for the phonetic rule-type--or, to repeat, at least for its phonetic-detail-rule subtype, whose features may have scalar (or "numerical") values). That is, when the output of a phonetic rule specifies, say, \([x + .4 \text{ gl. constr.}]\), this always means that the rule's application cumulates such a phonological feature value with the input value for the same feature. What is most important hereby is that phonetic rules thus need not, like phonological and morpholexical rules, completely replace a binary input-value for a given feature with an output value for it. Once this point is accepted, it appears that in fact all of the phonetic mirror-image rules proposed in GP to date will operate correctly if treated as single processes with simultaneously applying parts (i.e., conditions) rather than as schemata with conjunctively applied sequences of subrules. This can be verified, for example, based on the further examples of such processes dis-
(and also previously mentioned here).

However, the fact that non-phonetic rules thus all operate replacively--
rather than cumulatively--prevents us from again employing simultaneous
application as a way to derive exactly the right results for the likewise
abovementioned phonological mirror-image rule of glide insertion in Faro-
esee (given as a putative rule-schema in (13) above). Recall that the rele-
vant configurations which were criterial for demonstrating the disjunctive
application of the rule's alleged subrules (= (14) and (15) above) were
/...iu.../ and /...ui.../. If for such phonological strings we attempt to apply
glide insertion as a single rule with two alternative parts (environments), we
end up with only a single glide between the two underlying vowels, which is
correct, but also with a glide that is specified as [j] by one part of the rule vs.
[w] (→ [v]) by the other part. This is because the environment exemplified in
(14) bases the quality of the inserted glide on the quality of the first hiatic
vowel, while the environment in (15) bases the glide’s quality on that of the
second one.

However, it turns out that there is reason to question whether the facts of
Modern Faroese really justify a phonological mirror-image glide-insertion
rule like (13) above. Hellberg 1980 (cited approvingly as a reference for
Faroese by Anderson 1980c:77/1981a:531) notes (p. 14) that Anderson
1974c regards that glide-insertion rule as functioning, not only effectively to
"insert... [v] in hiatus between a non-high vowel and [u], and [j] between a
nonhigh vowel and [i]" (= via subrule (15) above), but also to "cover... the
insertion in hiatus of the glides [w] and [j] after high homorganic vowels..., as in húðir [huuwr] 'skins'... [and] biðja [bi:jə] 'to request'. But Hell-
berg 1980:15 then immediately states that, "in the most recent treatment of Faroese hiatus, it is explicitly claimed that no inserted element is to be found between the vowels in such cases as húðir and biðja (Zachariassen 1976:472)." If this is so, then only half (= subrule (15) above) of Anderson's overall glide-insertion rule-schema for Faroese (= (13) above) is valid—which means that (13) itself is not valid and hence not an example of a bona fide phonological mirror-image rule.

Furthermore, Hellberg 1980:15-18 goes on to give more information about the valid aspects of glide insertion in Faroese (especially in the various dialects) which suggest that this process may no longer be a purely phonological rule, due to its having been so heavily morphologized and lexicalized—in addition to being fragmented in its production of the two "glides" [j] and [v].

For example, "in the dialect of Suðuroy, only the [j] part of the rule applies..." (Hellberg 1980:15), but "the insertion of [j] must be regarded as morphologized" (p. 17). On the other hand, there "seems to be reason to regard [v] not as inserted but as representing an underlying segment, which could be argued to be /g/...[-i.e.,] as lexicalized" (p. 15). "In the Vágar dialect, ... [v]'s of ... [another] type have to be regarded as inserted, but not according to the quality of the ending vowel. Rather, the rule which inserts them must refer to certain grammatical morphemes, such as the masculine singular nominative /-ir/...[, and, s]ometimes, reference to diacritic features like conjugation [classes] is needed as well: the 2[nd] and 3[rd] person singular present /-ir/ satisfies the rule only if the verb is strong ... but not if it is weak.... In a traditional manner, this can be described as a morphologized rule for [v]-insertion.... Then the [j]-part of Hiatus Insertion can apply regu-
larly as a purely phonological rule.... We ... have to split the allegedly natural rule of hiatus insertion into two independent rules" (pp. 16-17).

Thus, for Faroese dialects in general, Hellberg 1980:15 states that "the phonetically natural alternation ... [which glide/"Hiatus insertion"] describes is matched without exceptions only by that variety of Faroese which is now obsolete. The dialects have changed the distribution of /i/ and /u/ in endings, but the fricatives [j] and [υ] are still inserted in the same stems as before.... This means that the fricatives are no longer generally inserted by regular application of Hiatus Insertion." Still, it may be true that, in some few dialects of Faroese, the "majority of the forms remain unchanged, [so that] it there makes sense to count with Hiatus Insertion as a still existing rule [(though not a mirror-image process)]... having the same phonological formulation as before and not having undergone general morphologization" (p. 17).

All this evidence from Zachariasen 1976 and Hellberg 1980 regarding the phonological, morphological, and lexical fragmentation of glide insertion in Faroese thus weighs strongly against the validity of Anderson's proposed phonological mirror-image rule of glide insertion for that language. It may be, of course, that such a process was found in some older (now obsolete) form of the (more) standard language or in one of its more isolated dialects. Still, the likelihood of such a possibility remains to be established.

Moreover, parallel conclusions seem to hold for the two other phonological--and hence allegedly disjunctively applying--mirror image rules proposed by Anderson 1974c:116-118. That is, the putative Oscan process of this type turns out to conflate two similar but actually different and hence ultimately uncollapsible rules, while closer examination of the suggested Ac-
oma process reveals it to be morpholexical rather than phonological.

Following Buck 1904:50-53, Anderson 1974:116-117 [(17)-(19)] mentions an Oscan rule of "anapytptic" epenthesis which he describes as inserting a vowel "in clusters of noncoronal obstructant and sonorant consonant.... The vowel of the ... syllable [containing the sonorant] ... determines the quality of the anapytptic vowel. ...[T]his rule was considerably general...: the sonorant can be ... r or l or a nasal, [and] the obstructant need not be a stop.... ...[M]ost importantly for our purpose, the rule applies in either direction. Thus, we have arAgetud (cf. Lat[en] argent...[ō 'silver (ablative')]}, MamerE...[ie}s [(a name; cf. Latin)... Māmercius ), Mulukiis [(another name; cf.]... Mulcius), as well as[--"with anapytysis applying in the opposite direction"--] sakArater ("is made sacred", from [earlier *]sakrater) and pukAlat...[u] [(yet another name, from ...[earlier *P]uclat...[ō (dative)])". Anderson therefore formulates roughly the following mirror-image rule, which is obviously phonological because it neutralizes the underlying distinction in Oscan between ò and a vowel:

\[
\begin{array}{ccc}
V & \text{αh} & \text{ighb} \\
\text{βlow} & \text{yback} & \text{round} \\
\hline
\emptyset & \% & \text{+sonorant} \\
\end{array}
\]

As a rule schema, this Oscan process would abbreviate the following two subrules, of which (17) handles cases like arAgetud and (18) handles ones like sakArater:

\[
\begin{array}{ccc}
V & \text{αh} & \text{ighb} \\
\text{βlow} & \text{yback} & \text{round} \\
\hline
\emptyset & \text{+sonorant} & \% \\
\end{array}
\]

\[
\begin{array}{ccc}
V & \text{αh} & \text{ighb} \\
\text{βlow} & \text{yback} & \text{round} \\
\hline
\emptyset & \% & \text{+sonorant} \\
\end{array}
\]

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Anderson 1974c:116-118 then argues that these proposed subrules must be ordered disjunctively. "The crucial cases ... here ... are those in which both rules ... could apply: that is, forms containing a cluster of the general form -RCR- [(where "R" stands for 'resonant')]. Fortunately, a few such forms are found in the corpus of Oscan: we have ...[A]nAfr...[f]ss, from ...[*A]nfr...[f]ss[,] with medial -nfr-, and HerEkle...[f]s, from [*]Herkle...[f]s, with medial -rkl-. The interesting fact to note, of course, is that -V\textsubscript{1}RCV\textsubscript{2}- becomes -V\textsubscript{1}RV\textsubscript{1}CRV\textsubscript{2}-... and not -V\textsubscript{1}RV\textsubscript{1}CV\textsubscript{2}RV\textsubscript{2}-.

Thus, of the two parts of the [Oscan anaptyctic] mirror-image schema..., evidently only the first part applies if both are applicable. This is just what we would expect if the parts of such a schema apply disjunctively."

In this regard, it should first be noted that the pair of "crucial" words cited by Anderson 1974c are in fact the only two such items given by Buck 1904:50-53 in his discussion of epenthesis. Thus, it is doubtful whether the "[a] few such forms" mentioned by Anderson number more than approximately two, although Vetter 1953:147 also lists the related dative-singular form HerEklúí, found on the Agnone Tablet in Samnium. In this regard, it can be observed that Buck 1904:4 reports that the entire corpus of "Oscan inscriptions number over two hundred, but more than half of these contain only proper names or fragments of words. About three quarters of them come from Campania, where Pompeii, and in recent years Capua, have furnished the greatest number." Since Buck's time, perhaps a hundred further inscriptions have come to light, especially also from Samnium (cf., e.g., Poccetti
Furthermore, the two crucial Oscan forms An Afríss (probably a dative/ablativ plural) and HerEklúi/HerEkleís (the latter a genitive singular) both seem to be proper names with somewhat vexed courses of possible etymology. For example, Buck 1904:51 glosses the former as (akin to Latin) "Imbríbus" (?); cf. also p. v, which discusses the conditional relevance of "An Afríss if = L[atin] Imbríbus", and p. 65n.b, where Buck considers the relation of the supposed Oscan name to its possible Latin equivalent via the root 'rain shower' (Latin imber) but then concludes that "[t]he connection of the two words is entirely uncertain."

The Herculean form HerEkleís (plus HerEklúi), on the other hand, suggests possibilities of sporadic borrowing via language contact—and not only with the Latin (genitive/dative) forms Herculis (/Herculi) but also with the corresponding Greek words Hērakléo(u)s (/Hērakléi; cf. also nominative singular Hēraklēs, etc.), although Etruscan influence is actually more likely. Suppose, though, that both An Afríss and HerEkleís/HerEklúi could be shown to be uncontaminated native Oscan forms with certain etymologies. In order to be sure that the anaptyctic vowel in either resulted from the disjunctive application of a mirror-image rule like (16) above, we would still need a secure chronology showing that the relevant pronunciation of the names in question arose at a time when both of the proposed subrules in the putative mirror-image rule of Oscan anaptyxis were operative and co-schematized.

Otherwise, it is possible that the vowels in question were inserted by a unidirectional epenthesis process of Oscan and then lexicalized, so that they were already underlyingly present by the time that a bidirectional mir-
ror-image process had evolved in the language. That such lexicalization occasionally took place is suggested by Buck 1904:53, who contrasts the presumptively truly anaptyctic vowel in *AadIrīs* (cf. Latin *Ātrius* [vs. *Atréus* (?)]) with its "extension" from thence into the related form AadIrans, where the non-agreement of vowel qualities contraindicates anaptyxis and bespeaks lexicalization (as manifested by apparent analogizing).

In fact, not only is there some evidence to support a hypothesis of separate origins in Oscan and earlier Italic for the two parts of the alleged mirror-image rule-schema of anaptyxis; there is also much related evidence to support the claim that, in synchronic Oscan, the two putative schematic sub-rules were subject to such different conditions that they cannot legitimately be collapsed within a single schema.

Anderson 1974c:117 strongly suggests that Oscan anaptyxis represents a "generalized" version of a related Latin rule which applied only after stops and before laterals (≈ a more specific version of Oscan subrule (18) above); cf., e.g., Latin *stablīs* > *stablīs* 'stable, steady'. However, the remarks of Buck 1904:50-53 make it clear that the application of anaptyxis subrule (18) was subject to significant restrictions not shared by subrule (17).

Hence, even if Oscan's subrule (18) indeed had the same pre-Oscan and pre-Latin proto-Italic origin as Latin anaptyxis, it appears to be the case that Oscan innovated its own subrule (17) and on its own generalized that separate process much more widely than the alleged co-subrule (17).11

Recall that, in subrule (17), anaptyxis separates a preceding liquid or nasal from a following obstruent—while, in (18), it separates a preceding obstruent from a following liquid or nasal. According to Buck 1904:51, "th[e
former]... type of anapyxis is one of the marked characteristics of ... Oscan (and Paelignian)"; he also speaks of the "regularity with which it appears". However, Buck further states that no anaptgetic vowel "develops ... between a liquid and a dental"—note, e.g., the anapyxis-free names Mamertino (cf. Latin Mámerīnā [probably ablative]) and Versorei (cf. Latin Versōrī [probably dative]) and the common-noun forms moito (cf. Latin multā 'fine [probably ablative]') and carneis (= 'part [genitive]'). Similarly, Buck implies (by omission) that anapyxis does not occur between a nasal and a dental.

These environmental limitations were presumably what led Anderson 1974c:117 [(17), (19)] to formulate both one anapyxis subrule (= (17) above) and the overall anaptgetic mirror-image rule-schema of Oscan (= (16) above) with a specification of [-coronal] for the relevant obstruents. However, Anderson's 1974c:117 [(18)] formulation of the other anapyxis subrule (= (18) above) as including the same [-coronal] specification for the relevant obstruents flatly contradicts the data presented by Buck 1904: 52-53, who lists numerous forms where an anaptgetic vowel appears after a dental obstruent and before a consonantal sonorant—e.g., patērerī 'father (dative)' (cf. Latin patriī), Sadiiriis (cf. Satrius), and the already above-mentioned Aadiiriis. Consequently, the specification [-coronal] must be removed from Anderson's anapyxis subrule (18), and this fact by itself prevents one from collapsing that process together with subrule (17) into a mirror-image rule-schema.

Yet there is even more evidence available suggesting that the two anaptyxes are independent rules. Even though Oscan anapyxis of subrule-(18) type (= with the obstruent preceding and the consonantal sonorant fol-
lowing) differs from subrule-(17)-type anaptyxis in applying after dentals, it is more restricted than the latter process in several important ways. According to Buck 1904:52, "...[t]his sort of anaptyxis ... is of a less determinate character than the ... [other]. It is subject to local variation [not shown by the other sort]: at least in the inscriptions of Capua [(= the most numerous ones; cf. above),] there is no indication of it in the spelling. Elsewhere it occurs regularly after short syllables... but is not entirely confined to this position, the more precise conditions not being clear."

Given all this proof of the distinctness of the two anaptyxis-processes represented by subrule (17) and the--as it turns out, misformulated--subrule (18) above, there is simply no possibility of collapsing them together as the mirror-image rule-schema (16) above, pace Anderson 1974c:116-118. Consequently, the interaction of the two (sub)rules under consideration is irrelevant, not only as regards the question of whether the alleged subrules of putative mirror-image schemata apply conjunctively or disjunctively, but also as regards the primary question at issue in the present section of this work--namely, whether the parts of mirror image rules apply sequentially at all, rather than simultaneously. Nevertheless, we still have the wherewithal to explain why anaptyxis of the type in (sub)rule (17) but not (sub)rule (18) above applies in the Oscan forms AnAfriss and HerEklefs. To wit, as Buck's abovementioned remarks make clear, the former type of epenthesis is simply the more widespread and dominant kind of anaptyxis in the language, tout court. (It is also possible that stress is relevant here, since Buck 1904:101 diffidently admits the possibility that Oscan had retained the "initial accent" of Proto-Italic. This possibility is strengthened by the fact that Oscan shows much more outright loss (rather than merely reduction) of me-
dial vowels than does Latin.)

The Faroese and Oscan processes thus being both moot in the relevant regard, it remains for us to consider only an Acoma deaccentuation rule as a last possible case from Anderson 1974c:116-118 which may require a proposed mirror-image rule to be interpreted as a schema whose subrules must be applied both sequentially and disjunctively. Anderson focuses on Miller's 1965:85 statement that a "short accented syllable before or after a glottalized sonorant [consonant (\= \textit{m}, \textit{n}, \textit{w}, or \textit{y})] usually loses its accent. If both of the syllables are short, either syllable (usually the first) may lose the accent, but never both".

Miller gives examples of this process which are set up by the morpho-
logical rule of "accent ablaut"--already discussed in a previous section of this chapter (= the one on the Weaker Crossover Condition)--in that the other rule changes all of the accents in a word to [+HIGH] ones when certain triggering suffixes are added to a stem. The "accent loss" now at issue therefore always operates on a high-toned accent. Thus, e.g., 'when I gave him a handful' is presumably [\textit{súwàáméešani}] at some stage of its derivation, but that form becomes [\textit{súwàáméešání}] when its first vowel is deaccented before a glottalized /\textit{w}/ via the present rule of accent loss. Similarly, 'when I stomped' is presumably [\textit{seýatáání}] at one of its derivational stages, but this other form becomes [\textit{seýatáání}] when its second vowel is deaccented after a glottalized /\textit{y}/.

Based on Miller's 1965 description, Anderson 1974c concedes that "...[s]ome morphemes are evidently exceptions to th[is accent-loss]... pro-
cess", although "the irregularities in some others are fairly clearly due to the operation of other rules." Still, based on glottalized-sonorant-adjacent de-
accentuations of single short vowels like those illustrated above, he formulates (p. 116 [(16)]) for Acoma roughly the following mirror-image rule:¹²

(19) \[
\begin{array}{c}
V \\
\text{-long} \\
\text{+HIGH} \\
\end{array} \rightarrow \begin{array}{c}
\text{[-HIGH]} \%
\text{[+sonorant]} \\
\text{-vocalic} \\
\text{+gl. constr.}
\end{array}
\]

Since in the analysis of Anderson 1974c this process is a rule schema, it abbreviates for him the following two subrules:

(20) \[
\begin{array}{c}
V \\
\text{-long} \\
\text{+HIGH} \\
\end{array} \rightarrow \begin{array}{c}
\text{[-HIGH]} / \\
\text{[+sonorant]} \\
\text{-vocalic} \\
\text{+gl. constr.}
\end{array}
\]

(21) \[
\begin{array}{c}
V \\
\text{-long} \\
\text{+HIGH} \\
\end{array} \rightarrow \begin{array}{c}
\text{[-HIGH]} / \\
\text{[+sonorant]} \\
\text{-vocalic} \\
\text{+gl. constr.}
\end{array}
\]

According to Anderson (p. 116), "Miller's [1965:85-86] statements and examples... evidently [leave] some [room for] uncertainty as to wh[at]... the order of expansion [for these subrules] should be..., but it is clear that the[y]... must be applied disjunctively"—given Miller's explicit statement that Acoma accent loss never deaccentuates both of two short high-accented vowels which surround a glottalized sonorant. Anderson 1974c chooses to order first the subrule in whose environment such a sonorant follows an adjacent short vowel, apparently because Miller indicates that it is usually the first vowel which is deaccentuated in cases of the kind here at issue.

What is most important for our present purposes, though, is that, if the process of Acoma accent loss is formulated as in (20) above, then it will not function properly if it is interpreted as a single, unitary rule whose parts apply simultaneously. Obviously, such an interpretation would incorrectly allow both of two short high-accented vowels surrounding a glottalized sonorant to be simultaneously deaccented, instead of at most one (albeit either one).
Hence, if Acoma accent loss is indeed a valid phonological mirror-image rule-schema, then it seems finally to constitute a crucial case demonstrating that (the parts of) such rules may not apply simultaneously, but only sequentially and in fact disjunctively.

In the present instance, however, it turns out that the proposed phonological mirror-image rule of Acoma accent loss is really a morpholexical rule. That is, rather than applying regularly except in certain morphological and lexical environments, the process is—as explicitly described by Miller 1965:85—"limited to certain constructions: ...[f]orms with accent ablaut[,] ...[d]escriptives, ...[t]hemes with the ... variable length morphophoneme..., [f]orms with ... ["thematic syllable extension"] that [have a particular] result...[,] and ...[s]hort syllables that result when ... [any one of three particular] thematic prefixes ... [is] added."

Now, it is true, as Anderson 1974c points out elsewhere (p. 231n.3), that "[i]t is very difficult to determine what, if any, generalizations can be made about the properties of suffixes causing accentual changes in Acoma. This is because, w]hile Miller's [1965] description is a model of completeness, he frequently goes out of his way to avoid making generalizations... and ... is also quite willing to make use of totally abstract 'process morphophonemes' as the conditioning factor for alternations whose conditioning is not phonetically transparent ." However, in the present case, it is not just Miller's short list of conditioning morpholexical environments which makes it clear that Acoma accent loss is not a phonological rule and so obviously cannot be a phonological mirror-image rule. The crucial other consideration here centers around Miller's statement that "[o]ne would expect free variation to occur (that is, between the operation and nonoperation of this rule), but it has
not been recorded."

That is, Miller's 1965:85-86 examples illustrating accent loss in Acoma show--to repeat--that configurations where two high-accented short vowels surround a glottalized sonorant are always altered by the deaccentuation of exactly one of the two vowels--never both (and usually never neither). However, while it is usually the case that the first vowel is the one deaccented, a substantial number of forms show deaccenting of the second vowel. This situation cannot adequately be handled by proposing that the first subrule in the/a mirror-image rule-schema of Acoma accent loss applies optionally, since this would imply that there should be free variation concerning which of two short vowels in consecutive syllables centering around a glottalized sonorant may be be deaccented. In fact, exactly the opposite is true: for any given Acoma word, Miller 1965 found only one pattern of accent loss, even though different words inexplicably show different patterns.

Consequently, it appears that the only valid description for Acoma accent loss is one where that rule is indeed morpholexical in type--in that it morphologically and/or lexically specifies which part (or subrule) of the process applies in the environment of a particular morpheme or word. Given this, however, it follows that the two parts (directionalities) of the Acoma rule in question are not really mirror-images of each other. Despite their core similarities in the phonological parts of their structural descriptions and changes, that is, the two processes must, if they are to operate correctly, each refer to numerous different morphological and especially lexical markings which make them completely disparate (i.e., complementary in their distribution of application). The two generalizations in question thus cannot legitimately be collapsed together, and so the general process of Acoma

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accent loss must, contra Anderson 1974c:116, be evaluated as neither phonological nor a mirror-image rule schema, but rather a complex of two similar and converse but nevertheless distinct rules. What is involved here, then, is at most the phonological equivalent of a morphological "rule constellation" in the sense of Janda and Joseph 1985/1986 and Joseph and Janda 1986.

There are thus no cases in Anderson 1974c of valid schemata involving phonological mirror-image rules, and so that work obviously provides no examples showing that such rules must apply sequentially, let alone disjunctively. However, Anderson 1969b/1971 had in fact earlier provided a case illustrating a valid phonological mirror-image rule in Old Breton, and it actually turns out that this process can operate correctly according to either a simultaneous or a disjunctively-sequential mode of application.

Following Fleuriot 1964, Anderson 1969b/1971:94-96 discusses the mutation of initial consonants in Old Breton. This process was then (= at least toward the end of the fifth century AD) "still transparently phonological", although it has long since been morpholexicalized in Modern Breton and in fact "most of the modern [Celtic] languages" (although cf. dissenting recent views like Lieber 1983--to be tempered with responses like Zwicky 1984). According to Fleuriot 1964:209, Old Breton phonological lenition (or "soft" mutation) turned /p, t, k/ into [b, d, g], /b, d, g/ into [v, ð, ɣ], and /m/ into [v] when they occurred between two vowels or between a vowel and one of the sonorant consonants /r, l, m, n/.

Anderson 1969b/1971:95 [(4.16)] points out that "...[i]n the position between a vowel and a sonorant..., the process applies regardless of whether the order is vowel - sonorant or sonorant - vowel. For example, "ar+petoc
gives ar+bedog, and *are+tren gives are+dren (which later becomes ardren). [Similarly, Norman 1973/1976:138-139 reports that, in effect, Old Breton *dar+bid gives dar·vid, and *ho+tiern gives ho+diern.] ... [Since] vowels are [+sonorant], as well as r, l, m, n, we ... can formulate th[e Old Breton mutation process]... as a ... [mirror image] rule applying between a vowel and a sonorant in either order", roughly as follows:

\[(22) \left[ -\text{continuant} \right] \rightarrow \left[ +\text{continuant} \right] \%V\_ [+\text{sonorant}] \]

As a rule schema, this Old Breton process would abbreviate (among others) the following two subrules:

\[(23) \left[ -\text{continuant} \right] \rightarrow \left[ +\text{continuant} \right] / V\_ [+\text{sonorant}] \]

\[(24) \left[ -\text{continuant} \right] \rightarrow \left[ +\text{continuant} \right] / [+\text{sonorant}] V \]

As evidence that these two processes actually belong together as parts of one rule, Anderson 1969b/1971:95-96 mentions the fact that, "in the modern language, where the conditions for the applicability of the corresponding change are rather complex morphological ones, they are the same for all of the segments affected."

Anderson 1969b/1971:95 also discusses whether "...[i]t might ... not [be] necessary to to formulate this process as a ... [mirror image] rule", since it could perhaps "instead be formulated as a single rule applying between two [+sonorant] segments. This is not the case, however; apparently clusters where both flanking sonorants are [-syll[abic], such as ltr, rpr, etc., are maintained unchanged.... It thus appears essential that one of the sonorants be [+syllabic], but irrelevant which." More important, though, is the fact that not only does the Old Breton mirror image rule of lenition "ap-
pl[y] to voiceless stops, making them voiced," but "voiced stops are [also] in turn subject to the rule, becoming spirants". Thus, the rule clearly sometimes operates as a neutralization process, is therefore a phonological mirror-image rule, and so is exactly relevant for our present purposes.

In particular, if the process in question receives an interpretation (like that of Anderson 1969b/1971) as a schema abbreviating two sequentially applied subrules, then, e.g., "p ... [will be] subject to both parts of the schema ... in every instance of [its] intervocalic [occurrence].... Since vowels are sonorants, the sequence V p V can be analyzed [in two ways: as]... either [+syl[abic]] p [+son[orant]] or ... [+son[orant]] p [+syl[abic]]." Given his assumption of sequential application of schematic subrules and the fact that "...[i]ntervocalic p in fact becomes b... and not v," Anderson 1969b/1971:95 therefore concludes that the two parts (= (23) and (24) above) of the overall Old Breton phonological mirror-image rule-schema of lenition (= (22) above) "must be expanded disjunctively... [and so] cannot represent a conjunctive schema."

However, it is also clear that interpreting the phonological mirror-image rule of lenition in Old Breton as a single, unitary process whose two parts (environments) are applied simultaneously likewise predicts all and only the correct forms for that language. What is crucial for rule (22) above is that voicing should not feed spirantization in cases (like that of abovementioned V p V) where the same segment could potentially undergo both a voicing version of the process in one of its environments (say, that in (23) above) and also a spirantization version of it in the other environment (e.g., that in (24) above). But such feeding is precisely what is made inherently impossible by an interpretation of (22) whereby the two parts within the Old Breton
phonological mirror-image rule of lenition apply simultaneously.\textsuperscript{13}

To sum up what the present section has shown, then, we can say that no valid mirror-image rules—whether phonetic or phonological—seem to require sequential application, and thus especially not disjunctive application. Rather, simultaneous application of a unitary, single rule’s parts is an equally workable mode of operation both for the several phonetic mirror-image rules that have been motivated in the literature (e.g., from the above-mentioned languages Chontal, Modern Breton, Old Irish, Ubykh, and perhaps Russian, as well) and also for the one phonological mirror-image rule (from Old Breton) that has here been found to be valid.\textsuperscript{14} On the other hand, those proposed phonological mirror-image rules which have been claimed to require disjunctive and hence sequential ordering (e.g., because simultaneous application yields the wrong results) have here been shown to be either not mirror-image processes (because of differences between their subrules which prevent their being collapsed into a single schema), as in Oscan, or not phonological rules (because of their morpholexical conditioning), as in Acoma, or (at least partly) both, as in Faroese.\textsuperscript{15}

Such a conclusion provides striking confirmation and additional support for the claim and existing arguments (previously presented here in Appendix IV immediately preceding the present Chapter V) which can be made to the effect that rules employing the notational devices of GP are not, as in the traditional generative view, rule schemata which abbreviate a set of subrules, but instead single, unitary rules. At the same time, however, the conclusion that the parts of all mirror-image rules apply simultaneously obviously entails giving up the proposed condition (here discussed in the preceding section of this chapter) that all sound-structural rules except those of
phonetic type are constrained to apply disjunctively (and hence of course sequentially) if they are mirror-image processes. Since this condition on mirror image rules previously served to isolate the phonetic rule-type from all others and thereby at least partially to validate the present sound-structural typology, its loss thus appears to remove some of the independent motivation for the latter.

It is clearly not unimaginable that some new phonological mirror-image rule may later be motivated which requires interpretation as a schema whose subrules apply in disjunctive sequential order, or that additional data supporting previously proposed rules of that sort might become available from one of the languages discussed earlier in the current section of this work (e.g., from the insertion rules at an even older stage of Faroese or Oscan, or from an incipient change in accent loss in Acoma). Barring such evidence, though, it appears that we simply lose the constraint on mirror image rules discussed in the previous section as a condition which helps to validate the present types of rules in sound structure.

Nevertheless, upon reflection, it appears that this investigation of mirror image rules has left us with a type-validating constraint on sound structure, after all. Recall our earlier conclusion that, regardless of whether phonetic (-detail) mirror-image rules are interpreted as sequentially applied schemata or as single rules with simultaneously applying parts, the application of the parts in such processes must be cumulative (= additive and/or subtractive) rather than replacive, as in the case of rules from all other sound-structural types. At that juncture, it was observed that the characteristically cumulative operation of phonetic(-detail) rules could be viewed simply as part of the definition for that particular sound-structural (sub)type. But, since our
general program here is to validate the present typology for sound structure with reference to differentially applicable conditions on the form, ordering, and application of the various rules-types, it is quite natural to view the cumulative manner of application shown by rules of phonetic(-detail) type as directly constituting its own condition on sound structure.

In this way, then, while our examination in the present section of mirror image rules from various types has not yielded a specific type-validating condition on mirror image processes in sound structure, it has actually yielded a much more general constraint on processes of phonetic(-detail) type which is thus just that much more confirmatory of the overall rule-typology which is here generally at issue. Since this more general restriction is nevertheless most obvious through the cumulative application of the parts in phonetic(-detail) mirror-image rules, though, we can continue to call it a "constraint on mirror image rules”.

V.5. On the Type-Distinguishing Characteristics of the Syllable-Totaling, Weak Crossover, Alternation, and Mirror Image Constraints on Sound-Structural Rules.

At this point, we actually have already isolated and thereby validated three of the four presently proposed sound-structural rule types through an investigation of their interaction with various conditions on the internal organization and operation of grammars. That is, the present chapter has shown that both the first-mentioned constraint on syllable-totaling rules and the Weaker Crossover Condition distinguish morpholexical from phonetic/phonological rules, while both the Alternation Condition and now the last-mentioned constraint on mirror image rules separate phonetic from phono-
logical and morpholexical rules.

It must be admitted, though, that the amount of available supporting evidence is not the same for all four of these conditions. The condition on syllable-totaling rules seems most robust, since twenty-nine examples support it, while there is at most one--only potential--counterexample to it. Once the constraint on mirror image rules is reinterpreted as a restriction governing the cumulative application of sound-structural rules, that principle seems hardly less well established. The Alternation Condition, however, depends on a particular assessment of the need to prohibit absolute-neutralization rules of all non-phonetic types (including postlexical ones) and is therefore perhaps more open to dispute. And, finally, the status of the Weaker Crossover Condition is at present somewhat up in the air--due to the possibility that the recent explosion of work in Multilinear Phonology has reduced its utility and possibly even cast some doubt on its validity, although a number of dissimilation rules reviewed here suggest that the Condition still has a useful and necessary role to play in sound structure.

One overall finding which emerges from all of this is that perhaps the primary division in sound structure separates phonetic and purely phonological rules, on the one hand, from morpholexical rules, on the other hand. In the following chapter (= VI), this division is reinforced by a demonstration that only morpholexical rules are exempt from a constraint against so-called "exchange rules". On the other hand, we have here not yet seen evidence for any condition on rule-form, -ordering, or -application which would require one to distinguish, within the morpholexical group, between morphological and lexical-correspondence rules. This distinction, however, will emerge from the more detailed consideration of the already abovemen-
tioned "Elsewhere Condition" to be presented in Chapter VII. In this way, these later chapters' discussions of further "interactive" conditions on sound-structural processes will further reinforce the divisions of the present rule-typology.
FOOTNOTES FOR CHAPTER V

1 Since the sequence ...i(d) is common to both of the allomorphs -i(d) and -si(d), and since the group of Estonian nouns which are suffixed with -si(d) is thus a proper subset of the set of such forms suffixed with ...i(d), it is likely that this situation involves two lexically free rules whose conjunctive application violates the "Elsewhere Condition" briefly mentioned above (especially in Chapter IV) and to be discussed at somewhat greater length later in the present chapter (to the extent that "Elsewhere" intersects with the "Alternation Condition"). It seems, that is, that Estonian partitive plurals marked by -si(d) reflect the conjunctive application of a specific -s suffixation rule and a following general -i(d) suffixation rule. However, my knowledge of Estonian and access to intelligible sources and authorities on the language is at present so limited that I will not pursue this possible instance of an "Elsewhere" violation any farther (e.g., even in Chapter VII, which focusses entirely on the constraint in question).

2 The issue of distinguishing syllable-totaling vs. (the location of) stress as the essential conditioning factor for a sound-structural rule arises not only with regard to the Dyirbal instrumentive/comitative and transitive-verbalizing suffixes but in fact for nearly every rule discussed as a possible syllable-totaling process in the present section of Chapter V. This is because, when secondary stress is taken into account, words with differing numbers of syllables usually have different overall stress-patterns. Actually, then, it would be possible to reanalyze as stress-conditioned many or even most of the morpholexical rules treated as syllable-totaling above in the
main text.

However, recall the abovementioned morphological rule of apocope in Lardil nouns, which applies only to trisyllabic or longer forms. This rule thus fails to delete an unstressed final vowel in a bisyllable at the same time that it apocopes the unstressed vocalism at the end of a tetrasyllable (or hexasyllable, etc.) and even, it seems, deletes an occasionally secondarily-stressed final vowel of a trisyllable (or pentasyllable, etc.)--cf., again, Hale et al. 1981-MS:8. Such facts make unlikely and therefore unattractive an analysis of Lardil noun apocope where the relevant conditioning is not the total number of syllables in a form but instead the location of stress(es)--even though such an accentual account is possible (viz., in nouns, delete any final vowel that is not preceded by a primary stress).

Still, although such non-syllable-totaling, stress-based reanalyses are often extremely suspect and hence not preferable, they sometimes appear to be quite plausible alternatives--as, e.g., when a morphological apocope rule applies only to polysyllables in a language with initial stress. And, finally, there is no denying that the total number of syllables in a word and its stress pattern are just frequently intimately tied up with one another in a general way.

3 Howard 1975:112n.6 admits that the general name "Crossover Condition" for a phonological constraint is potentially quite confusing--because of its homophony with the rather different syntactic constraint proposed by Postal 1968/1972 (still reflected by the frequent discussion in the current syntactic literature of "weak-crossover effects", etc.). Howard mentions that he once entertained the idea of using the suggested name "Passover Con-
dition" as a replacement, but he apparently rejected this move on quasi-theological grounds.

4 "Accent ablaut" in Western Keresan is further discussed by Valiquette [in preparation] in specific regard to Laguna, a Keresan dialect/language closely related to (and even mutually intelligible with) Acoma—especially since Laguna has an equivalent of Acoma accent ablaut.

As also implicitly suggested further on in the main text, part of Acoma accent ablaut can obviously be restated in Autosegmental terms as a process whereby the inherent high tonal accent of certain suffixes automatically spreads to all syllables in a preceding stem (or, occasionally, where a suffix without an inherent non-high tonal accent also has a floating high tonal accent preceding it, which therefore automatically spreads leftward). However, in order for such spreading to take place, all the syllables in a stem must previously undergo a process of tonal-accent erasure. And this potentially long-distance process would seem to require formalization involving an essential variable parallel to the one in Anderson's 1979:12 account, reformulated as Rule (5) above in the main text.

5 Anderson 1980c:78-83/1981a:531 has suggested, however, that the Alternation Condition (AC) can be satisfied, not only by spoken, phonetic forms in the dialect whose grammar is at issue, but also by such forms from related dialects spoken in the same speech-community and even by orthography—a consideration which, a priori, seems eminently plausible. On the other hand, the fact that these extended alternations are all undeniably language-related makes puzzling Anderson's further claim that they
help provide "Evidence against the Linguistic Character of the Condition".

6 None of these three rules is morpholexical, although this may seem questionable in view of the fact that Dudas 1976 formulates two of them (those for mid vowels) with reference to stem boundaries. The phoneticity of the two processes at issue can, however, be maintained because, in an inherently cyclic theory like Lexical Morphology and Phonology (LMP), the relevant rules can be written in such a way that they simply refer to a final word-boundary at the pre-suffixation stage in derivations where they apply.


8 This claim--that (only) phonetic rules are exempt from the requirement that all phonological (and perhaps even all sound-structural) mirror-image rules must be analyzed as schemata whose subrules have to be applied disjunctively--can be found in Anderson and Browne 1973:462-463, Anderson 1974a:2, and Anderson 1975:41, but it is rather misleadingly expressed there. That is, especially the latter two works imply that the "principle of disjunctive ordering" which governs mirror-image examples of "phonological rules proper" (but not "phonetic detail rules" of any kind) is the same principle that "was later modified (along lines originally due to Panini) by Anderson ...1969[b/1971], 1974[c]..., ... the modified version [being] further argued for by Kiparsky ...1973[b and]... an essentially similar constraint
[subsequently being] proposed by Koutsoudas, Sanders and Noll ...[1971/]
1974... under the name of 'proper inclusion precedence'"--i.e., the "Else-
where Condition" (discussed here at fair length earlier in the main text and
even more detailedly in Chapter VII below).

Nevertheless, the disjunctivity of non-phonetic mirror-image rules actu-
ally must be stipulated as an ad hoc principle, since it does not follow from
the Elsewhere Condition (EC). This is because the EC governs only cases
where specific vs. general rules conflict, whereas the subrules of mirror-im-
age schemata are necessarily always equally specific and do not necessar-
ily conflict with each other (e.g., as in the Acoma and Old Breton examples
presented above in the main text).

9 For critical discussion of this (particular formulation of the) rule for
Faroese glide insertion, see--among others--especially Norman 1973/
1976:141-145 and Goyvaerts 1975. It should also be noted that, while this
process and many others in the same section of the main text (as well as
elsewhere in this overall work) can easily be reformulated in multilinear
terms via the formalisms of Autosegmental Phonology and Metrical Phonol-
ogy (cf. the references in Appendix II above), such reformulation is actually
orthogonal to the questions primarily at issue here. Hence it should be as-
sumed that merely a space-economical abbreviatory function devoid of the-
oretical significance is being such exercised throughout this work by my use
of apparent notational anachronisms like the feature [stress] (rather than
metrical trees and grids), syllable-, morpheme-, and word-boundaries (rath-
er than reference to membership in suprasegmental constituents of those
types), epenthesis as full-segment insertion (rather than as skeletal-slot in-

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sertion with concomitant autosegmental spreading or lexical-phonological
default-rule application), and so forth.

10 This conclusion regarding the non-unity of the alleged co-subrules in
Faroese glide insertion is consistent with the fact that, as is apparent from
Hellberg's 1980 discussion (quoted here in the main text) of Anderson's
1974c analysis, an inserted back glide [w] remains unchanged when in-
serted by subrule (14) but becomes [v] after being inserted by rule (15).

11 In fact, the likelihood that the two Oscan anaptyxes and the one cor-
responding Latin process had a common historical origin is even further di-
minished by the fact that the Latin rule has a rather late chronology vis-à-
vis its Oscan counterpart(s). (I owe this observation to Rex Wallace, who
also provided helpful guidance in all other factual and analytical matters
concerning Oscan insofar as that language figures in the present work. For
further discussion and references bearing on the Osco-Umbrian sphere
within Italic, see Wallace 1984.)

12 Giving Anderson's 1974c version of Acoma accent loss a reformula-
tion in terms of syllables would obviously be more in accord, not only with
Miller's 1965 description (quoted in the main text), but also with current
practice in Multilinear Phonology and with what is presently known about
tone and accent in general. However, since such a multilinearization is not
really relevant to the issue of disjunctive vs. conjunctive (and sequential vs.
simultaneous) application of mirror image rules, I have here essentially re-
tained Anderson's segmental account of the Acoma phenomenon in ques-
tion, which deaccents only certain short vowels, rather than entire syllables containing them.

Valiquette [in preparation], however, provides Multilinear-Phonological accounts for the tonal/accentual phenomena of Acoma's mutually intelligible closest Keresan neighbor Laguna, along with some crossdialectal/crosslinguistic comparison. He likewise concludes (as here further below in the main text) that Acoma accent loss, far from being a single phonological mirror-image rule, is actually a set of morpholexical non-mirror-image rules.

13 Norman's 1973/1976:138-141 alternative claim that the apparent disjunctivity required for Old Breton lenition can be effected by some form of the Elsewhere Condition (EC) as set up by the presence of angled brackets in the lenition rule (see (22) here in the main text) must be rejected. This is because Norman mistakenly assumes that the voicing and spirantization rules to be disjoined are expansions of the same mirror-image subrule, whereas Anderson's 1969b/1971 discussion (quoted here in the main text) makes it clear that two different mirror-image subrules are involved and that the latter do not stand in the proper-inclusion relationship required by the/ an EC.

On the other hand, Norman 1973/1976:136 does present a suggestive example from Spanish (provided for her in a personal communication by James Harris) which seems be a phonological (i.e., neutralizing) mirror-image process whose subrules must nevertheless not apply disjunctively but rather conjunctively (on a sequential, schematic interpretation of notational conventions) or else simultaneously (on a non-schematic interpretation of them). However, a much fuller range of facts and analytical possibilities
concerning Spanish must be considered before this (latter) claim by Nor-
man and Harris can be regarded as conclusively established.

14 Obviously, many more mirror-image rules have been proposed with-
in GP than just those which have been alleged to require conjunctive or dis-
junctive ordering and are therefore discussed here in the main text. For in-
stance, further examples are discussed by Anderson 1969b/1971:89-91,
1974c:111-113 from Yuma, English, and Icelandic. Some such cases (like
the latter two of the three just mentioned) seem to require an interpretation
of mirror-image rules as schemata containing ordered subrules, since it
might appear inherently impossible to impose ordering on the parts of a mir-
ror-image rule if it is treated as a single process whose parts apply simultane-
ously.

However, the very formalism of mirror image rules imposes an inherent
asymmetry in that it requires the singling out of one apparent subrule for re-
placement of its "/" by "%"--almost as the "name" or "citation form" of a given
mirror-image rule, so to speak. Hence it does not seem unreasonable to
impose a general and intuitively natural convention on such rules to the ef-
fect that the environment chosen for expression with "%" is primary, so that
the part of the mirror image process corresponding to it applies first. Such a
move then preserves the attractiveness of an approach where all putative
rule schemata actually function as single, unitary rules--as here advocated
at length in Appendix IV above.

15 There is even some room for doubt concerning whether alleged
phonetic mirror-image rule-schemata really contain pairs of subrules which
are identical except for the directionality of their environments. For one thing, the nature of phonological and phonetic strings is simply such that there are asymmetries between phonological elements which are not maintained across opposite directionailities (e.g., in the sequence $V_1CV_2$, the C syllabifies with $V_2$; in $V_2CV_1$, however, it syllabifies with $V_1$).

Still, a response might be made to this fact in terms of "modularity", in the same sense that Kiparsky 1985:87 (in the spirit of Chomsky 1981) has suggested that "severely restrictive principles govern the application of lexical rules...", so that in many cases it becomes possible to treat a lexical and postlexical process as a single rule in spite of radical differences in mode and scope of application, because the differences are predicted by those principles". Parallely, then, it might be argued that each (phonetic) mirror-image rule-schema involves only one principle of phonetic input and/or output, but that separate principles governing different aspects and directionailities of phonological strings affect that single original principle differentially, so that quite unlike effects may result from the application of paired subrules within the same schema.

On the other hand, though, the findings of Anderson 1980c/1981a regarding the ubiquitous tendency for sound-structural rules to become lexicalized and thus denaturalized suggest that even such originally predictable low-level differences may be reanalyzed and exaggerated in a way that would prevent the collapsing of two otherwise identical subrules into a phonetic mirror-image schema. But this is ultimately an empirical matter which will probably not be resolved until more research is devoted to "phonetic implementation rules", as in studies like Liberman and Pierrehumbert 1984 (positively evaluated by Kiparsky 1985:86).
APPENDIX V
An Overview of the Markings for the Estonian Partitive-Plural

The following table is based on the one in Viks 1982:24-25 but here appears in a radically revised version (made under the helpful guidance of Joel Nevis) based on further factual and analytical material from Aavik 1982:1-10 and Lehiste 1983:180-181. A large number of abbreviations have been employed, as follows: "N.S." = 'nominative singular' (the usual citation-form); "P.P." = 'partitive plural'; "VC" indicates partitive-plural formation by vowel change (to a vowel given immediately afterward, in parentheses); "<...>" marks stems whose partitive-plural marking is morphologically determined (i.e., by a suffix); "<<...>>" marks stems whose partitive-plural marking is lexically determined (i.e., is idiosyncratic); "<<<<...>>>" marks loanwords (for which stress is indicated--with pre-syllabic "[']"--when it non-natively occurs on non-initial syllables); "/.../" encloses segments which are phonologically but not orthographically present; a single slash separates alternative forms (with the more common one listed first, and "theoretically possible" but uncommon forms in parentheses); unbracketed hyphens selectively reflect relevant morpheme-boundaries, and underlining indicates an overlong syllable.

<table>
<thead>
<tr>
<th>CATEGORY--</th>
<th>P.P. Stem:</th>
<th>P.P. Marking:</th>
<th>N.S.:</th>
<th>Gloss:</th>
</tr>
</thead>
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<tr>
<td>STEM LENGTH--</td>
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<td></td>
</tr>
<tr>
<td>1 syllable--</td>
<td>(overlong:)</td>
<td>koi-</td>
<td>-sid</td>
<td>koi</td>
</tr>
<tr>
<td></td>
<td>&lt;&lt; maa/-</td>
<td>-id</td>
<td>maa</td>
<td></td>
</tr>
<tr>
<td>CATEGORY--</td>
<td>P.P. Stem</td>
<td>P.P. Marking</td>
<td>N.S.</td>
<td>Gloss</td>
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<tr>
<td>STEM LENGTH--</td>
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<tr>
<td>2 syllables--</td>
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<td>none overlong:</td>
<td>kõne-</td>
<td>-sid</td>
<td>kõne</td>
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<td>vilu</td>
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<td>VC(i)</td>
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<td>'woman'</td>
<td></td>
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<td>&lt;&lt; tūtre-</td>
<td>-id</td>
<td>tūtar</td>
<td>'daugh-ter'</td>
<td></td>
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<tr>
<td>1st overlong:</td>
<td>kidna-</td>
<td>-id</td>
<td>kinnas</td>
<td>'glove'</td>
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<td>-id</td>
<td>teo-s</td>
<td>'work'</td>
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<td>-sid/(VC(u))</td>
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<td>'hay'</td>
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<td>-sid/-id</td>
<td>i[ˈldee</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 syllables--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none overlong:</td>
<td>ohu-tu-</td>
<td>-id</td>
<td>ohu-tu</td>
<td>'harmless (one)'</td>
</tr>
<tr>
<td>sōr-mu-s-e-</td>
<td>-id</td>
<td>sōr-mu-s</td>
<td>'ring'</td>
<td></td>
</tr>
<tr>
<td>puna-se-</td>
<td>-id</td>
<td>puna-ne</td>
<td>'red (one)'</td>
<td></td>
</tr>
<tr>
<td>1st overlong:</td>
<td>māär-u-s-e-</td>
<td>VC(i)</td>
<td>māär-u-s</td>
<td>'degree'</td>
</tr>
<tr>
<td>endi-s-e-</td>
<td>VC(i)</td>
<td>endi-ne</td>
<td>'earlier (one)'</td>
<td></td>
</tr>
<tr>
<td>1st, 2nd overlong:</td>
<td>maa-</td>
<td>VC(e)</td>
<td>maa-</td>
<td>'scenery'</td>
</tr>
<tr>
<td>stikk-u-</td>
<td>stikk/k/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 syllables--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none overlong:</td>
<td>kirjut-u-s-e-</td>
<td>VC(i)</td>
<td>kirjutu-s</td>
<td>'writing'</td>
</tr>
<tr>
<td>oluli-se-</td>
<td>VC(i)</td>
<td>oluli-ne</td>
<td>'existent (one)'</td>
<td></td>
</tr>
<tr>
<td>inime-se-</td>
<td>VC(i)</td>
<td>inime-ne</td>
<td>'person'</td>
<td></td>
</tr>
</tbody>
</table>
| 2nd overlong: | << me[ˈlloodia-] | -id | me[- | 'melo-
| | 'lloodia | 'dy' | |

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It should be noted that, for several of the words listed above, Viks 1982: 24-25 gives numerals standing for general types of partitive-plural formation, along with figures for the number of words employing each type, as follows: (1) ohutu (10,600 words), (2) oluline (12,300 words), (3) köne (820 words), (4) vilu (560 words), (5) sepp (9,000 words), (6) hein (18 words), (7) önne li k/ (1,300), (8) koi (220 words), and (9) idee (120 words).

Finally, two remarks may be offered concerning the loanwords in the above table. First, it may be speculated that the irregular partitive-plurals of many loanwords in general are the result of speakers' omitting from their calculations of word length all pretonic syllables--which are never found in native forms, since these always have initial stress. Second, it may be that the absence of vowel change in the partitive plural of meloodia 'melody' in particular is due to the fact that the vowel change otherwise expected here would produce a heterosyllabic vowel-sequence which is normally disfavored in Estonian.
Second Subpart

[= Chapter VI]
CHAPTER VI
A Constraint on Exchange Rules

VI.0.

This chapter presents a particular characterization of the notion "exchange rule" and then establishes that, while there exist at least fourteen valid exchange-rules of morpholexical (morphological or lexical-correspondence) type, not a single one of the fifteen purely phonological exchange-rules proposed in the generative literature is valid. Most of the morpholexical rules in question have been motivated in previous works, and some of their phonological counterparts have likewise been previously criticized. However, for nearly every proposed phonological exchange-rule already challenged in the literature, the current chapter provides further supporting counterarguments. And it also presents arguments against several putative phonological exchange-rules which apparently have never before been questioned. Given such findings, the main conclusion to be drawn from this discussion is that exchange rule phenomena constitute additional support for the synchronic rule-typology outlined in Chapter IV above--since they, too, require sound structure to differentiate between phonetic and phonological rules, on the one hand, vs. morphological and lexical-correspondence rules, on the other hand.

The chapter begins by defining "exchange rules" as processes which systematically interchange the complete identities of one or more pairs of segments in exactly the same environment. This situation cannot be determined solely on formal grounds, but only also functionally: from comparison of a rule's inputs and outputs. Formally, exchange rules are a subset of
"alpha-switching rules"—which, however, can be given a completely formal characterization. After examples illustrating these different types of rules are given, there follows a discussion of the proposed requirement that sub-rules of exchange rule schemata—when these are interpreted as derivative abbreviations for primitive processes—should be disjunctively or simultaneously ordered with each other.

Next, the chapter discusses the evidence motivating the fourteen valid morphological exchange-rules found in the literature on generative grammar. This situation is then compared with that of putatively phonological exchange-rules. First, a proposed case from Menomini is dismissed. Second, the Vowel Shift exchange rule of SPE is shown to be an inferior account vis-à-vis at least three other analyses not involving exchange rules. Before further alleged exchange-rules are criticized, though, it is pointed out that tonal processes of this type are inherently impossible, since they cannot systematically interchange complete segment identities. Then, new reasons are presented to support the rejection of three proposed phonological exchange-rules criticized by Anderson and Browne 1973 and/or Anderson 1974c. Besides an Icelandic example and Wolfe's 1970/1972a/1975a Czech and Old Prussian cases, the chapter also considers and rejects several purported phonological exchange-rules not considered by Anderson and Browne.

Among these rejected processes are a further two suggested by Wolfe (for different sets of British English dialects), three argued for by Kiparsky 1965/1971a (from Old High German, Modern Corsican, and Modern Armenian), two proposed by Malone 1970, 1972 (for Ma'lula Aramaic and Tiberian Hebrew, respectively), and two presented in SPE but most strongly
championed by Zonneveld 1976. Finally, Zonneveld's Brussels Flemish example is considered in detail—especially in the light of further data not discussed by him—and then rejected as not actually requiring an account employing any exchange rules. The chapter closes by favoring an outright limitation of exchange rules to the morphological and lexical-correspondence rule types. Such an approach is to be preferred—given the earlier arguments presented here and elsewhere for treating rule schemata as unitary primitive rules—over an indirect restriction whereby exchange rule schemata are treated as abbreviations for sets of primitive rules and only morpho-lexical exchange-rules are allowed to apply workably: i.e., disjunctively or simultaneously.

VI.1. Distinguishing "Exchange Rules" from "Alpha-Switching Rules".

Let us first consider the general nature of "exchange rules", which will here be defined as processes that, for a given segment A and a given other segment B, systematically and directly convert A into B and B into A in exactly the same environment. Exchange rules, that is, exchange the identity of whichever of two segments is found in a specified environment with the identity of the other segment. Such rules are conspicuous in Generative Phonology (GP) because of their distinctive formal appearance. Almost immediately after Halle 1962a introduced the device of Greek-letter variables over +/− into generative-phonological notation, Bever 1963:199-200, 202 pointed out that this device gave rise to the possibility of rules written in the following general form: \( zF, \alpha G, \beta H, \ldots \rightarrow [-\alpha G, -\beta H, \ldots] / X \left[ \frac{Y}{Z} \right] \)

For any pair of segments differing only in that they have opposite values
for one or more features, a rule of the foregoing form can convert each
member of the pair into the other by reversing the necessary feature values
in the requisite environment given above (where any or all of X, Y, and Z
may be null), as appropriately limited by the feature(s) [±F, ...] in the input,
which restricts the rule to those pairs of segments whose members' identi-
ties should be interchanged. In Standard GP, each exchange-rule is a rule
schema corresponding to at least two individual subrules (+ → - and
- → +), and this expresses the intended generalization that the identity re-
versal thereby effected (via feature value reversal for one or more pairs of
segments) constitutes a unitary fact.

In the sense in which they are being defined here, then, all exchange-
rules (= processes affecting the members of at least one pair of segments
by exchanging their identities with each other in exactly the same environ-
ment) have the formal characteristic [αF] → [-αF]. However, it is crucial to
note that the converse of this statement is not true. That is, not all phonolo-
logical rules with the formal characteristic [αF] → [-αF]—what I will here call
"same-feature alpha-switching rules"—are exchange rules in the pres-
ent sense. What is more, no phonological rules having the formal charac-
teristic [αF] → [-αG] (where F ≠ G)—what I will here call "different-feature
alpha-switching rules"—are exchange rules in the present sense. In
short, exchange rules as presently defined are a proper subset of "alpha-
switching rules" in general (i.e., all those processes having the formal
characteristic [α...] → [-α...], regardless of the features involved), and so
they are by no means coextensive with the latter. Unfortunately, these dis-
tinctions have never all been explicitly made in the GP literature (although
Fox 1976 comes very close to making most of them), and much confusion

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has demonstrably resulted from this lacuna.

In particular, the abovementioned lack of precise definitions, plus the presence of inherent ambiguity in the term "exchange (rule)" (which can refer either to segment identity exchange or to feature value exchange/reversal), has led to a situation where certain restricted claims about exchange rules as defined in the present way have been misinterpreted as much more sweeping claims about alpha-switching rules in general. At least part of the recent controversy concerning "exchange rules", then, stems solely from terminological unclarity. In order to illustrate the need for making the distinctions drawn above, let us consider some concrete examples which are available from the literature.

Bever 1963:200, 202 and 1967 proposed a rule for Menomini (a Central Algonquian language still spoken in Wisconsin) which performs the exchange \( (e \rightarrow æ, æ \rightarrow e) \rightarrow C\{y, w\} \) on the underlying vowel system \( /e, æ, o, a/ \). In terms of more recent generative-phonological practice, this rule can be reformulated as follows:

\[
(1) \quad \begin{array}{c}
\begin{array}{c}
\begin{array}{c}
V \\
{-\text{back}} \\
{\text{low}}
\end{array}
\end{array}
\end{array} - \begin{array}{c}
\begin{array}{c}
\begin{array}{c}
{-\text{vocalic}} \\
{-\text{consonantal}}
\end{array}
\end{array}
\end{array} / C \begin{array}{c}
\begin{array}{c}
\begin{array}{c}
{\text{high}}
\end{array}
\end{array}
\end{array}
\end{array}
\]

The form of this process makes it a same-feature alpha-switching rule; its effects (mentioned above) make it also an exchange rule. Probably the most famous same-feature alpha-switching rules which are also exchange rules, though, are undoubtedly the pair linked in the English Vowel Shift schema presented in Chomsky and Halle 1968:243 [(33)] et passim.

If one ignores certain complications in the rule's environments which are essentially irrelevant for the present purpose, Vowel Shift à la SPE can be (re)formulated as follows:
(2) \[
\begin{array}{c}
V \\
+\text{tense} \\
+\text{stress} \\
\text{ā back} \\
\text{ā round}
\end{array}
\rightarrow
\left\{ \begin{array}{c}
\text{[-β high]} / \left[ \begin{array}{c}
\text{low} \\
\text{β high}
\end{array} \right] \\
\text{[-γ low]} / \left[ \begin{array}{c}
\text{high} \\
\text{γ low}
\end{array} \right]
\end{array} \right. 
\]

Among the tense vowels, the first subrule performs approximately the interchanges \((i \rightarrow e, e \rightarrow i)\) and \((u \rightarrow o, o \rightarrow u)\), while the second one effects roughly the exchanges \((e \rightarrow \text{ā}, \text{ā} \rightarrow e)\) and \((o \rightarrow \text{ū}, \text{ū} \rightarrow o)\). (Here, the macron indicates tense variants of symbols otherwise usually taken to represent lax vowels, and IPA \([o]\) is used for a low back rounded vowel, rather than \(\text{SPE}'s [ɔ]. An essentially identical formulation of (2)---but in terms of geminate vowels, rather than tense ones---is given by Lass 1976:23 [(15b)]. Actually, a version of basically the same rule was developed and circulated by Halle and Chomsky as early as 1963-1964. In response to this, however, Stockwell 1964, 1966/1972/1975 proposed an alternative account of the (synchronic) English Vowel Shift which involves alpha-switching rules that are not exchange rules. Most importantly, in Stockwell's analysis, the Vowel Shift processes are preceded by a rule centralizing (and unrounding) tense high vowels. This process has roughly the effects \((i, u) \rightarrow \text{ī}\) and can be reformulated as below:

\[
(3) \quad V \\
\begin{array}{c}
\text{+tense} \\
\text{+high}
\end{array}
\rightarrow
\begin{array}{c}
\text{+back} \\
\text{-round}
\end{array}
\]

Although Stockwell did not do so (largely because he was employing a different feature system), it is in fact possible to follow the above centralization rule with a Vowel Shift rule formally identical to that of Chomsky and Halle in \(\text{SPE}\)--hence, with a same-feature alpha-switching rule. The prior
operation of the centralization rule, however, has the consequence that, on
Stockwell's approach, Vowel Shift performs essentially the changes e → i
and (i → ɪ, o → u), followed by ə → e and (ə → a, ʊ → o). (The ma-
crons--here, as throughout this discussion--again mark tense counterparts
of normally lax vowels.) Among the operations performed by Stockwell's
rule, there are no interchanges of segment identities, and so his Vowel Shift
does not function as an exchange rule in the present sense. This distinct-
ness of alpha-switching rules and exchange rules was indeed implicitly rec-
proposed that "switching rules be permitted to apply only to fill holes--thus
not permitting ... [segments] to switch places [(= identities)]". In the present
terminology, this is a proposal that alpha-switching rules are permissible
only if they are not also exchange rules.

Mainly in answer to Stockwell's (then still unpublished) counterproposal
for handling the English Vowel Shift, Chomsky and Halle 1968:187-188,
256-259, 355-357, 394-396 (and, according to 466, also 397-399) devoted
several rather extensive sections of SPE to discussions of alpha-switching
rules (which they unfortunately called "exchange rules")--especially
those which "result in the type of phonetic switch that supposedly affects in-
telligibility" (p. 257): i.e., exchange rules as defined here. At one point,
Chomsky and Halle actually more or less explicitly state that not all alpha-
switching rules are exchange rules (in the present sense).

That is, they point out (earlier on p. 257) that, if a language had an
alpha-switching rule (in the present terminology) of the form
[V, ərəʊnd] → [-ərəʊnd] applying directly to an underlying vowel system
/i, e, ə, o, u/, then that process would not be an exchange rule (as here
defined), since it would produce roughly [ü, ö, ʊ, ʌ, ʊ] and therefore involve no interchanges. However, if the same language added a vowel-fronting rule V → [-back] /... to its grammar whereby (u → ü, o → ö, a → æ), and if that new rule were ordered before the abovementioned rounding-shift rule, then the latter would be(com) an exchange rule (in the current sense), since it would involve the interchanges (i → ü, ü → i) and (e → ö, ö → e). This is, of course, a completely hypothetical example, but we have already seen a real illustration above, in the case of English Vowel Shift.

On the SPE account, that is, the same-feature alpha-switching process of Vowel Shift is an exchange rule (as defined here); on Stockwell’s account, where a centralization rule precedes it, the exact same formulation of Vowel Shift is not an exchange rule (of that type). It is obvious, then, that— as Chomsky and Halle 1968:257 say in a slightly different way—"it is impossible to tell from the form of a rule in isolation" whether or not it is an exchange rule (in the present sense). Rather, this can be told only by pairing a rule’s inputs with their outputs and then seeing whether any of these pairs are mirror images across their arrows (i.e., A → B vs. B → A). More or less the same point was also made, later, in McCawley 1974:73-74/1975:176-177, preliminary portions of which were circulated as early as 1969 and 1971.

After the above motivation of the distinction between exchange rules and same-feature alpha-switching rules, it remains only to illustrate the difference between the former two rule-types and different-feature alpha-switching rules. Harms 1968:61-62 discusses an instance of the latter based on his 1966:234 [(13a)] analysis of Southern Paiute (a member of
the Southern Numic subgroup of Uto-Aztecan belonging to the postulated larger Aztec-Tanoan family. In this language, according to Harms, velar continuants show the shifts (\(\gamma \rightarrow x, i \rightarrow x;\)), which can be reformulated as the following single rule:

\[
4 \begin{bmatrix}
\text{-sonorant} \\
\text{+continuant} \\
\text{+high} \\
\text{+back} \\
\text{+voice} \\
\end{bmatrix} \rightarrow \begin{bmatrix}
\text{-voice} \\
\text{-long} \\
\end{bmatrix}
\]

Formally, this process is manifestly a different-feature alpha-switching rule, but its effects show just as definitely that it is not an exchange rule. For similar examples, see--among other works--Wang 1968:697, 707/1975:379-380, 391 [(6)-(9), 19] et passim.)

In fact, as far as I can determine, it is logically impossible for different-feature alpha-switching processes to be exchange rules. This is because each distinct variable in the input of one of these rules allows it to apply to a pair of segments differing in their values for the feature whose specification is variable, but such application does not change the values of that feature in those segments. As a result, the output of each of the two subrules that correspond to a variable in a different-feature alpha-switching rule-schema will differ in at least one feature from the input of the other subrule--and so no complete identity exchange between two segments can possibly be effected by the type of rule in question.

Summarizing our discussion of the current topic up to this point, we can say that alpha-switching rules in general are formally distinguishable by their characteristic \([\alpha...] \rightarrow [-\alpha...];\) same-feature alpha-switching rules, by their characteristic \([\alpha F] \rightarrow [-\alpha F],\) and different-feature alpha-switching rules, by their characteristic \([\alpha F] \rightarrow [-\alpha G],\) where \(F \neq G.\) Exchange rules, on the
other hand, have only a necessary formal characterization as \([\alpha F] \rightarrow [-\alpha F]\), but not a sufficient one. Exchange rules form a subset of same-feature alpha-switching rules, that is, but are not further characterizable formally. Rather, they can be isolated only functionally--by one's identifying (same-feature alpha-switching) rules at least one of whose input segments is identical with one of their output segments, and vice versa.


Many scholars, though, have noted a particularity of exchange rules and/or alpha-switching rules in general that relates to the ordering of the subrules within the schemata which express them. Probably the first signifi-
cant discussion of this issue was that of Chomsky 1967:103-104/1972b:530-531, who pointed out that exchange rules (in the present sense—though he did not use any descriptive term for such processes) give rise to a solvable ordering-problem. Each exchange-rule schema abbreviates a pair of subrules of the form \( A \rightarrow B / X \_\_ Y \) and \( B \rightarrow A / X \_\_ Y \). Thus, if all phonological rules apply conjunctively (= in sequence, the application of any one rule not prejudicing the potential application of any other rule), then, regardless of their ordering, the subrules in exchange rule schemata will always undo each other. E.g., \( A \rightarrow B \) followed by \( B \rightarrow A \) will yield only \( A \), while \( B \rightarrow A \) followed by \( A \rightarrow B \) will yield only \( B \). This situation, though, obviously flies in the face of the fact that, presumably, such exchange rules exist only because both \( A \) and \( B \) are required outputs.

Chomsky 1967:123/1972b:544 suggested that this difficulty could nevertheless be easily overcome. The solution is to treat Greek letter variables as a special case of the well-known GP abbreviatory convention of parenthesis notation, for which disjunctive ordering is prescribed: the application of the first subrule in a parenthesis rule schema precludes the application of any other subrule. In SPE:357, 396, Chomsky’s earlier proposal of disjunctive ordering for the subrules in exchange rule schemata is maintained and extended. SPE imposes disjunctive ordering not only on same-feature alpha-switching rule-schemata in general (where it is likewise crucial that the paired subrules not interact, since they would feed and undo each other), but also, in fact, on all rule-schemata containing Greek letter variables (where disjunctivity is often not necessary, since the abbreviated subrules do not interact—e.g., in assimilation and dissimilation).

Chomsky and Halle 1968:357 note, however, that, although same-fea-
ture alpha-switching rule-schemata are like parenthesis rule schemata in requiring disjunctive ordering, they differ from the latter in not requiring any particular sequence of their subrules' application. Hence, SPE proposes that the disjunctivity imposed on the "variable convention ... [involves] an arbitrary choice in the ordering of the rules derived from the schema with variables" (loc. cit). Obviously, this arbitrariness of ordering suggests that the subrules in Greek-letter-variable rule-schemata could just as well be applied simultaneously. This possibility had actually already been entertained tentatively (earlier in SPE) by Chomsky and Halle 1968:355 and was later definitively adopted by Anderson 1974c:91-97. And, as discussed in Appendix IV above, it is also possible--if not preferable--to interpret exchange rule schemata (and all others) as single, primitive rules for which no ordering of subrules is required.


Given such reinterpretations and/or ordering stipulations, alpha-switching processes can obviously be made to work appropriately--this is universally accepted. The controversial question has been, rather, whether well-motivated examples of such rules really exist, and--if so--whether all of their subtypes are exemplified in the world's languages. In particular, it has been claimed--by Anderson and Browne 1973:461-464, 477-478, Anderson 1974a:2, 1974c:96-97, 1975:41, 1979a:11-12, 1985:335, and McCawley 1974:74n.33, 81/1975:177n.14, 186-187 (and repeated in Sommerstein 1977:133 and Kenstowicz and Kisseberth 1979:366)--that there exist no bona fide exchange-rules of purely phonological type (in the sense of the present evolutionary rule typology [ERT]). Rather, all non-spurious ex-

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change-rules (as defined here) are alleged to be of morpholexical (= morphological or lexical-correspondence) type, so that phonological/linguistic theory would appear to need a restriction to this effect.

The significance of this claim for the ERT is, of course, that a constraint requiring exchange rules to be morphological or lexical in type cannot be straightforwardly stated unless one first recognizes at least a morpholexical type of sound-structural rules distinct from phonological rules proper (as well as from phonetic rules). Such a constraint would thus provide strong support for the ERT and its particular rule-types, and so it is clearly crucial to investigate the claims and counterclaims that have been made in the literature regarding the phonologicality vs. morpholexicality of (various/all) exchange rules. In so doing, I will here be concerned only with exchange rules as defined above: processes that systematically and directly inter-change the identities of two or more segments in exactly the same environment. This is arguably the sense of "exchange rule" presupposed in the writings by Anderson (and Browne) cited above.

As I said earlier, though, works disputing the alleged morpholexicality of all exchange-rules have sometimes misinterpreted such claims as ones concerning alpha-switching rules in general, with the result that the heretofore unresolved state of the exchange rule debate should come as a surprise to no one. I therefore want to make it unmistakably clear that, in the present study, I am not disputing (or even centrally considering) whether there exist purely phonological alpha-switching rules, of either a same-feature or a different-feature sort. Rather than focussing on these formally idenifiable processes, I am instead concentrating on exchange rules as an (in the final analysis) only functionally isolable operation. In order to show
that well-motivated examplars of this sort exist at all, I will begin by presenting an overview of the accepted morpholexical cases.

Anderson and Browne 1973:457-561 list approximately ten languages or dialects with morpholexical exchange-rules, the latter involving consonantal voicing reversal, vocalic length reversal, and vocalic quality exchange. Probably the best-known morphologically conditioned exchange-rule is that found in Dinka (a Western Nilotic language belonging to the Eastern Sudanic subgroup of the Chari Nile branch of the Nilo-Saharan family). This process has been discussed by Gleason 1955:28, Anderson and Browne 1973:459-461, Anderson 1974c:92-96, and Kenstowicz and Kisseberth 1979:366, all on the ultimate basis of data from Nebel 1948. A substantial class of Dinka nouns form their plurals by reversing the original value of the feature [long] for their stem vowels, by a process of roughly the following form:\(^2\)

\[
(5) \begin{array}{c}
\left[ +\text{NOUN} \right] \\
\left[ +\text{PLURAL} \right] \\
/ X \left[ -\text{vocalic} \right] \left[ -\text{consonantal} \right] \left[ +\text{segment} \right] / \Rightarrow \\
1 \quad 2 \quad 3 \\
\end{array}
\]

Thus, for example, čiin 'hand' has the plural čin, while nín 'sleep, slumber' has the plural níin. The rule in question is noticeably a morpholexical one. First of all, there is the presence of the feature [PLURAL]. Moreover, since not all Dinka nouns reverse the length/shortness of their stem vowels when they pluralize, the rule is also lexically limited. Hence, it is morpholexical as both morphological and lexical; in the present typology, the Dinka rule in question is thus a lexical correspondence.

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An almost identical rule (marking plurality on verbs) is described by Walker 1970 for Diegueño (a Delta-Californian language in the Yuman branch of the Hokan family). There, however, the vowel-length-reversing rule primarily marks verbal plurality and is so lexically free as to be a morphological rule (proper). A probable final instance of vowel length reversal is found in the diminutivization of feminine nouns in Czech (cf. Anderson and Browne 1973:460). The process there accompanies suffixation of -ek/-ka/-ko (often preceded by hypocoristic -ec/-in), although this vocalic-length reversal rule is of somewhat limited scope and productivity (cf. also op. cit., p. 479n.7).

However, it is clear from Anderson and Browne 1973:458-461 (following Gregersen 1972/1974) that consonantal-voicing reversal (usually accompanied by suffixation or other word-formational operations) is a major, productive process in the morphology of some of Dinka's relatives—the Western Nilotic languages Adhola, Alur, Anuak (both its Acoli and Pâri dialects, though with a slightly different form in each), Luo, and Shilluk. There, this voicing/devoicing marks both plurality and a kind of singular possession—and, in some of the languages, it is accompanied by a reversal of consonantal (pre)nasality, as well.

Furthermore, Anderson and Browne 1973:457-458, 461 cite a West Semitic verbal Ablaut process (previously discussed by Chomsky and Halle 1968:356-357) whereby various vowels exchange their qualities as part of the marking of the imperfective aspect. SPE only briefly mentions the Aramaic version of this rule, instead focussing on the Biblical Hebrew and Classical Arabic versions (the latter of which has quite recently been reformulated by McCarthy 1979:290-295 [(51)]/1982a, 1981:403-404 [(46)].

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In addition, although Anderson and Browne 1973 make no reference to it, Chomsky and Halle 1968:357 discuss a similar vowel quality exchange that marks pluralization in Kasem (a Northern Grusi language of the Central Gur (Voltaic) subdivision in the Niger-Congo branch of the Niger-Kordofanian family). Finally, it can be mentioned that, immediately before or after the publication of the joint article just mentioned, there appeared two proposals concerning (two) exchange rules for English that interchange vowel quality features in certain irregular forms of verbs, nouns, and/or adjectives. The rule proposed by Hoard and Sloat 1973:112 [(8)] reverses mainly vocalic front/backness (based on an exchanging readjustment-rule in SPE:209-210 [(75)], 238 [(1)] et passim); cf. tell/told vs. hold/held), while the rule proposed by McCawley 1974:87, 74n.33/1975:168, 177n.14 interchanges vowel height (cf. grow/grew vs. choose/chose).

A perusal of the works cited above (plus their references) corroborates that each of the previous examples involves a rule performing a feature reversal which directly interchanges the identities of two or more segments in precisely the same environment. It is therefore clear that there are at least fourteen languages or dialects in the world whose grammars contain exchange rules (as here defined): Adhola, Alur, Acoli-Anuak, Päri-Anuak, Classical Arabic, Aramaic, Czech, Diegueño, Dinka, English (with two rules), Biblical Hebrew, Kasem, Luo, and Shilluk. It is true that many of these languages/dialects are genetically related to one another (—of the fourteen, seven are Nilotic; three, West Semitic, and two, Indo-European), and they are also heavily concentrated (areally) in or near Africa. Nonetheless, it is still the case that all of these languages must be considered to have different grammars, with different sound-structural rules. Hence, the
above overview has indeed yielded a total of at least a dozen morpholexi-
cal exchange-rules--easily double the "about half a dozen" reported by

VI.4. A Reconsideration of the Two Oldest Alleged Phonological Exchange-
Rules.

VI.4.0.
From this, we can conclude, first, that well-motivated exchange-rules of
some kind definitely do exist and, second, that at least a goodly number of
them are morpholexical (= morphological rules or lexical corresponden-
ces). It now remains to be established that none of the putative purely pho-
nological exchange-rules proposed in the literature can be certified as valid
when subjected to close scrutiny. This entails (re)considering approximate-
ly 14 more processes and showing them to be either actually morpholexical
(hence not solely phonologically conditioned) or else not really unitary rule-
schemata--or even bona fide rules--after all. For about half of the rules at is-
sue, Anderson and Browne 1973 and Anderson 1974c:96 have already
carried out this task, and so we need only review their conclusions here.

VI.4.1. Menomini Vowel Height Alternations as Morpholexical and/or Non-
Exchange in Character.
Thus, e.g., the Menomini front-vowel height exchange analyzed by Bever
1963, 1967 as purely phonologically conditioned (cf. (1) above) has
been shown by Goddard 1972 to be reanalyzable, in the words of Anderson
and Browne 1973:479n.9 and Anderson 1974c:96n.3, as a "morpholexical
[phenomenon,] rather than [a] phonological [one]. (This would then actually swell the number of attested morpholexical exchange-rules to fifteen.) Alternatively, a purely phonological account of the Menomini facts that does not involve an exchange rule has been presented by Lu 1977:197-200.

VI.4.2. English Vowel Shift Accounts Not Involving Exchange Rules.

VI.4.2.0.

Similarly, Anderson and Browne 1973:447 also observe that Stockwell's previously mentioned 1964, 1966/1972/1975 alternative account of English Vowel Shift—with High Vowel Centralization (= (3) above) ordered before Vowel Shift (= (2) above)—does not involve an exchange rule (although it does involve a same-feature alpha-switching rule), and that it is at least as cogent as the (likewise previously mentioned) exchange rule account of Chomsky and Halle 1968, where centralization does not precede Vowel Shift, but instead follows it.

Actually, this fact is virtually conceded by SPE:219 itself, which admits that "[t]he major phenomena for which the Vowel Shift and centralization rules are designed (namely, alternations such as divine--divinity, profound--profundity) can, in fact, be handled about as well with either analysis. But ... [various] subsidiary phenomena that we have discussed...—specifically, ... [certain] irregular verbs ... (e.g., drive--drove...), ... various minor back vowel alternations, etc.—cannot, so far as we can see, be subsumed under even partial generalizations if the alternative ordering is accepted."

Moreover, McCawley 1974:65-68/1975:165-169 has demonstrated that
the "subsidiary phenomena" referred to above by Chomsky and Halle 1968 actually cannot be incorporated into—or, rather collapsed with—Vowel Shift, since the rules needed to account for them either are incorrectly formulated in SPE (and so not of the appropriate form to be built into Rule (2) above) or else are separated from Vowel Shift by intervening rules (and so likewise not collapsible with (2)).


Quite apart from Stockwell's non-exchange-rule analysis of English Vowel Shift as a double same-feature alpha-switching process, at least one alternative account of the alternations in question has been proposed which utilizes a different-feature alpha-switching rule. Rules of this type, it will be recalled, can never function as exchange rules. Wang 1968:700-703/1975:383-386 suggested that the feature [low] be replaced by [mid], the feature [round] by [labial], and the feature [back] by [palatal] and [velar]. Wang pointed out that English Vowel Shift can then be restated—using these new features—with a "one-stage structure, using a pair of variables...[for a] rotational type of alternation" (p. 700/383), roughly as below (after p. 707/391 [[19]]):³

\[
\begin{align*}
V & = +\text{tense} \\
& = +\text{stress} \\
& = +\text{labial} \\
& = +\text{velar} \\
\beta_{\text{high}} & \rightarrow \gamma_{\text{mid}} \\
\gamma_{\text{mid}} & \rightarrow -\beta_{\text{mid}}
\end{align*}
\]

Essentially an identical rule is seconded by Erdmann 1972:268 [[19]].

When expanded, Wang's rule schema includes the following subrules: (\(i \rightarrow \overline{\alpha}, u \rightarrow \overline{u}\), (\(e \rightarrow i, o \rightarrow u\), (\(\overline{\alpha} \rightarrow \overline{e}, \overline{u} \rightarrow \overline{o}\), and (\(\overline{e} \rightarrow e, \overline{u} \rightarrow o\). In
order to yield all and only the right results for English, Wang's account must settle two further issues. First, the \([\varepsilon, \tilde{a}]\) produced by the rule must somehow be raised to /e, o/. Second--and concomitantly--the fact that the sub-rules performing the changes \((\varepsilon \rightarrow e, \tilde{a} \rightarrow o)\) have no English underlying tense lower mid vowels to operate on must somehow be explained, since this seems to suggest that one of the subrules which (6) above abbreviates (or, alternatively, expands as) does not really exist. That is, (6) appears to be a violation of the usual conventions in GP for interpreting abbreviatory notational devices.

Wang 1968:702 [(13)], 707/1975:386 [(13)], 391 handles the needed raising of \([\varepsilon, \tilde{a}]\) to \([e, o]\) via the feature-changing operation of a "redundancy rule ... applying... in phonological derivations whenever it is applicable":

\[
\begin{align*}
& V \\
& [+\text{tense}] \\
& [+\text{mid}] \rightarrow [+\text{high}]
\end{align*}
\]

Now, it is true that, with the advent of Lexical Morphology and Phonology (LMP; cf., e.g., Kiparsky 1982a, 1982b), there has been a tendency to re-interpret \textit{SPE}-type redundancy rules (like morpheme structure constraints [MSCs]) as processes which apply to fill in values for un(der)specified features--just as they were interpreted in GP before \textit{SPE} (and even in the early part of \textit{SPE}). However, language-particular redundancy rules are still rarely considered to be "anywhere rules" which can apply at every stage of a derivation and so--after their feature-filling operation--are capable of applying again, in a feature-changing capacity.

Wang's rule (7) must therefore currently be interpreted as a further phonological rule (beyond Vowel Shift \textit{per se}) which just happens to mirror the redundancy rule stating that English has no underlying lower mid vowels.
Whatever its virtues or vices, this apparent duplication of redundancy rules by phonological rules proper is, of course, by no means uncommon.

Surprisingly, though, the related issue of the seemingly nonexistent English subrules ($\ddot{e} \rightarrow e$, $\ddot{o} \rightarrow o$) in Wang’s 1968/1975 Vowel Shift rule schema equivalent to (6) is not even mentioned by him, and it appears to have gone hitherto unnoticed by everyone else—including several respondents to, and commentators on, the work in question. This is all the more strange in view of the fact that Wang 1968:703-704/1975:387-388 himself explicitly criticizes the SPE Vowel Shift rule for including—in its full, final version (with additional environments besides ones like that in (2) above)—a subrule which is obviously not a possible part of English phonology, since it includes a pair of contradictory values for the feature [high]. (On this, cf. also McCawley 1974:67-68/1975:168-169.)

Nevertheless, there is a way to obviate the problem posed by Wang’s "apparently nonexistent" Vowel Shift subrules—in a manner that depends on the possibility of variant conceptions of the notational devices and conventions used in GP. That is, as discussed at length in Appendix IV above, there exists at least one plausible alternative to the SPE approach to notational conventions, in which Chomsky and Halle treat rule schemata as secondary, derivative constructs abbreviating sets of primitive subrules. Rather, several arguments favor a conception of putative rule-schemata as primitive rules themselves. On this view, there obviously arise no problems with vacuous subrules, and the issue of disjunctive ordering does not really even come up, since each rule with at least one notational device in it is a single entity, rather than an abbreviation for a set of subrules.

As already mentioned earlier, in Appendix IV, much more fleshing out of
this proposal is obviously needed before it can be fully implementable for all rule-schemata in GP. But it seems to be a promising suggestion that is especially appropriate for the Greek letter variable notation, particularly as that device appears in alpha-switching rules.

In the case of rules with the formal property \([\alpha\ldots] \rightarrow [-\alpha\ldots]\), that is, a reinter-pretation of this entity formerly taken to be a schema as, instead, a single rule allowsRequires one to say that such alpha-switching processes consist in simply reversing the value of the feature(s) in question. Most of all, this approach captures exactly the essence of these rules, but it also allows one to dispense with worries about how to avoid conjunctive ordering of two subrules (via disjunctivity or simultaneity of application; cf. Section VI.2 above) or about how to deal with vacuous subrules. Thus, the subpart \([\beta\ h\ h\ g\ h\ \ y\ m\ i\ d\] \rightarrow [\ y\ h\ g\ h\ \ -\beta\ m\ i\ d\] of Wang's English Vowel-Shift rule in (6) above can be interpreted as just an operation that (1) changes the value of an input segment for the feature [\ h\ g\ h\] so as to agree with its original value for [\ m\ i\ d\] and (2) changes the value of an input segment for the feature [\ m\ i\ d\] to the opposite of its original value for [\ h\ g\ h\]. And absolutely no prediction is thereby made of a non-existent pair of subrules \(\varepsilon \rightarrow e, \ddot{o} \rightarrow o\), simply because English has no underlying tense lower mid vowels \=/\varepsilon, \ddot{o}/.

Given the above discussion, in Appendix IV, of the variant interpreta-
tions for notational devices and rule schemata that have been given in GP—as derivative (abbreviatory and expanding), versus primitive and unexpandable—it turns out that there are in fact two ways to solve the "non-existent subrule(s)" problem detected earlier in Wang's Vowel Shift rule. One way is to treat vacuous subrules expanded from primitive schemata as secondary and unproblematic, as SPE:346 does; the other is to analyze rules with no-
tational devices in them as unexpandable primitives that thus have no sub-

The second approach seems preferable, but adopting either suffices to
make Wang's 1968/1975 English Vowel Shift rule, (6) above, workable
and acceptable. And so we can conclude that, as long as it is supplement-
ed with an additional phonological (née "redundancy") rule raising [ɛ, ɐ] to
[e, o], Wang's different-feature alpha-switching analysis constitutes a sec-
approach) to Chomsky and Halle's 1968 exchange rule treatment of En-
lish Vowel Shift in SPE (which, to repeat, actually dates from even earlier).

VI.4.2.2. Settling on a Non-Exchange-Rule Account of English Vowel Shift.

In comparing these three analyses, we can recall, first, that the actual
Vowel Shift rules of SPE and Stockwell can be identical, and that Stock-
well has a single pre-Vowel-Shift Centralization-rule (= (3) above), where-
as SPE has a set of two post-Vowel-Shift centralization processes (Rounding
Adjustment and Backness Adjustment--to be presented and discussed
later as, respectively, (24) and (25) below). These two sets of rules are,
however, of roughly equal overall complexity. On the other hand, Wang's
Vowel Shift rule (= (6) above) has 9 features, as opposed to 11 in the ver-
sion employed by Chomsky and Halle (also usable by Stockwell; cf. (2)
above), but this is offset by the fact that Wang also needs a 4-feature rais-
ing-rule (for tense lower mid vowels; cf. (7) above) which the other two ac-
counts can dispense with entirely.

Wang's analysis must therefore be ranked as slightly more complex
than the others. Since this disadvantage is compounded by the fact that
Wang's two rules, (6) and (7) above, presuppose a feature system with features (like [mid] and [velar]) that have found comparatively little resonance in the literature, it is understandable that his account has not been widely taken up. In fact, one is probably obliged to conclude that Wang's different-feature alpha-switching approach--despite its virtues of performing all the Vowel Shift changes in a single step and of requiring fewer features in so doing--is neither a superior nor an equally good alternative to the Chomsky/Halle exchange rule solution (which necessarily employs a same-feature alpha-switching rule).

It is nevertheless possible to formulate a same-feature alpha-switching process for English Vowel Shift that has all of the following characteristics: it employs the same features as SPE's rule (which is also my recasting of Stockwell's 1966/1972/1975 one); it rotates all and only the relevant vowels in a single step; it does not require an additional raising-operation (or any other supplementary fix-up process), and, in comparison with the abovementioned other rules, it even has as few or fewer features. This third/fourth proposed type of Vowel Shift rule (beyond those already considered here so far: SPE's/Stockwell's and Wang's) was--to the best of my knowledge--first formulated (as the inverse counterpart of a non-English tone rule) in Janda 1978-MS; it was later elaborated in Janda 1986a. The rule in question is here reproduced with no essential modifications:  

\[
(8) \quad \begin{bmatrix} V \\
+ \text{tense} \\
+ \text{stress} \\
\text{aback} \\
\text{around} \\
\langle \text{low} \rangle \end{bmatrix} \rightarrow \begin{bmatrix} \text{low} \\
\langle \text{high} \rangle \end{bmatrix}
\]

In explicating this rule, let me initially follow the notational conventions.
of SPE. First off, it should be remarked that, although such a configuration is by no means common, Chomsky and Halle's 1968:394-395 "Expansion Convention (c) [(13)] permits ... [the] angled bracket notation to be used to form conditions that also involve variables on features." Second, in interpreting angled-bracket schemata, we can follow the stipulations in SPE: 125n.78, 212n.42, as modified by Sommerstein 1977:140 [(112)]. Thus, for the features [high] and [low], we can expand (8) into the two disjunctively ordered schematic subrules: (a) [β\text{high}, β\text{low}] → [β\text{low}, -β\text{high}] and (b) [β\text{high}, -β\text{low}] → [β\text{low}]. The first of these, (a), in turn abbreviates the two likewise disjunctively ordered subrules (i) [+\text{high}, +\text{low}] → [+\text{low}, -\text{high}] and (ii) [-\text{high}, -\text{low}] → [-\text{low}, +\text{high}], and the second, (b), abbreviates the two final disjunctively ordered subrules (iii) [+\text{high}, -\text{low}] → [+\text{low}] and (iv) [-\text{high}, +\text{low}] → [-\text{low}].

Third and finally, it remains only to invoke, for subrule (iii), a familiar convention of rule application that is often presupposed but seldom formulated. Anderson 1974c:78-79, however, coincidentally discusses the very case at issue: "Features not mentioned in the SC of ... [a] rule are assumed to be unaffected by its operation, and to be the same in both input and output, with one exception...[, which] arises through certain formal properties of the feature system, by which certain feature specifications are incompatible with one another: for example, a segment cannot be simultaneously [+\text{high}] and [+\text{low}], since the tongue body cannot be both raised and lowered from ... [the] neutral position simultaneously. ...[T]his is not a fact about particular languages, but about the feature system itself, and the definition of the feature system must contain specifications of such incompatibilities. ... Incompatibilities due to the structure of the feature system, such as the
impossibility of [+high, +low], we assume to be corrected by a convention reflecting these universal facts. Thus, when a rule [(like subrule (iv) of (8) above)--RDJ] makes a segment [+low], we assume that it is also specified as [+high] without the rule's needing to mention this fact explicitly." (Cf. also Chomsky and Halle 1968's markedness and "linking" convention(s) (6VII) and (6XVII) in SPE:404-406, 408, 411-412, 421, and especially 434-435, on English Vowel Shift and related rules.)

Given all of the above, we can see that subrule (i) is, like our earlier example from Wang's 1968/1975 schema, a vacuous one. That is, since no segment in any language can be [+high, +low] (cf. the passage just quoted), nothing will ever be able to undergo (i), and so it will never apply. The other subrules, though, perform all the Vowel Shift changes needed for English: (ii) (e → i, o → u), (iii) (i → ə, u → ʊ), and (iv) (ə → e, ʊ → o).

By means of Rule (6), then, and with standard vowel features, we can accomplish all the necessary vowel movements and nothing extra--possibly aside from the issue of vacuous subrules, which (as shown in Appendix IV above) it is Chomsky and Halle's 1968 practice to treat as if they did not exist, anyway. On an SPE-type interpretation of rule schemata, all of the subrules in (8) are disjunctively ordered, so no input segment can incorrectly undergo Vowel Shift twice. And, of course, if McCawley's non-abbreviatory interpretation of notational conventions in GP is accepted (also cf. again Appendix IV above), then there is neither a vacuous subrule nor any disjunctive ordering associated with rule (8), since it really has no subrules at all. Rather, the rule just always operates once, correctly, on all appropriate and available input segments. 5

In addition, rule (8) even has two fewer features than the SPE Vowel
Shift rule (= 2) above; also usable by Stockwell), and it has exactly as
many features (= nine) as Wang's 1966/1975 rule. Finally, no other rules
are needed to modify the output of (8) except ones that are also needed by
other accounts (e.g., centralization processes). The formulation of English
Vowel Shift in (8), then, appears to be the most highly valued and thus the
preferred version out of the four so far considered. And the important thing
thereby is that (8), although a same-feature alpha-switching rule, is not an
exchange rule, since it never functions to perform a direct exchange of the
identities of any two segments. Based on such considerations, it follows
that Chomsky and Halle's 1968 exchange rule analysis of English Vowel
Shift must be rejected, as unnecessary and non-optimal.

This conclusion immediately leads one to ask whether any other formu-
lations (besides SPE's) have been proposed for the English Vowel Shift
rule which function as exchange rules. Here--although there exist at least a
dozen other versions of English Vowel Shift--the answer turns out to be
"no."

A few other same-feature alpha-switching processes have been sug-
gested--e.g., by Imai 1971/1975:415-419 [especially (6)-(9)], Ladefoged
146-153 [especially p.148], and Hoard and Sloat 1973:107-109 [especially
(3)]. None of these formulations, however, has the effects of an exchange
rule .

There are also (besides that of Wang 1968/1975) yet other different-
feature alpha-switching versions of Vowel Shift: e.g., one of the rules in
Stockwell's own original 1966:14-16, 34 [(6[-S])] formulation; cf. also Hill
1966/1968:83-84 [(3, 2')], Vennemann [genannt Nierfeld] 1971a-MS:20-
410 [especially (2), (11), [Appendix rule] (4)], 1974:221-224 [especially (3)],
Again, though, the operation of these processes obviously is inherently
such that it does not interchange any pairs of segments.

Moreover, there have been a few additional Vowel Shift rules proposed
for English which use Greek letter variables but involve no alpha-switching.
These include, e.g., the other rule in Stockwell's own original 1966:14, 15,
16, 33 [(5[-S])] formulation, as well as a one-step reinterpretation of SPE's
rule in Sommerstein 1977:133 [(91)].

Finally, there are several proposed formulations of English Vowel Shift
which do not even use variables: e.g., one subrule in Ladefoged 1971,
(16)] and pp. 82-83 [(30)]], (inferentially) Bailey 1973:219 [(16)] et passim,
Nichols 1974:234-236 [especially (22)], Anderson and Jones 1977:78-90
[especially (III.43), (III.58)], 133-134, 157 [(V.54)], and Sommerstein 1977:
132-133 [(89)]).

Since none of all these many alternative formulations of English Vowel
Shift functions as an exchange rule, it is not necessary to consider them any
more closely than has just been done. In particular, it is irrelevant to evalu-
ate whether they are superior to the version presented here in (8) above.
This is because, even if they should turn out to be preferable to that formu-
lation, they would then--by transitivity--also rank as preferable to SPE's ex-
change rule account, and so would likewise entail the latter's rejection.
Nevertheless, I believe that the formulation of English Vowel Shift given in
(8) is superior to the others just surveyed. In comparison to (8), that is, these latter all either are excessively complex (in terms of features, feature specifications, and/or conditions—e.g., the rule in Vennemann 1971a-MS/1978) or else employ non-standard features and feature specifications for which there has been little motivation and even less acceptance—or both (e.g., all the rest of the rules in question). But this will have to be actually demonstrated at another place and on another occasion. (For some discussion, though, see Janda 1986a.)

In any case, however, the above discussion of English Vowel Shift has definitely established that SPE's proposed exchange-rule analysis must be rejected as at least unnecessarily complicated. And this then means that both of the two putative purely phonological exchange-rules discussed so far—the two earliest ones proposed, Bever's 1963, 1967 Menomini example and Chomsky and Halle's 1968 English case (first formulated in 1963)—are spurious. Let us now, therefore, proceed briefly to consider (or reconsider) later suggested purely phonological exchange-rules, starting with those discussed by Anderson and Browne 1973 and Anderson 1974c:96. Among these, the most interesting cases, in a sense, are provided by alleged tonal exchange-rules. As a general class of sound-structural process, the latter are accepted by the two works just mentioned as bona fide purely phonological rules, and such they indeed are. But we can show here that closer scrutiny of them reveals that they are, on the other hand, not really exchange rules, after all.

VI.5. The Inherent Impossibility of Tonal Exchange-Rules.

The crux of this matter of whether there exist tonological processes
which are exchange rules is the above definition of exchange rules as processes that systematically and directly interchange the complete identities of pairs of segments (in exactly the same environment). Since tonal rules do not systematically affect the overall identities of segments, instances of such processes that exchange tones (via manipulation of tonal feature values) never effect complete segmental interchange--except by accident, when two input segments differ only in their associated tones.

Let us consider, for example, a case from Cháozhōu (a member of the Southern Min, or Min Nan, subdivision of Southern Sinitic (Chinese) within Sino-Tibetan). On the basis of data from Lǐ 1959, Wang 1967:102-103 reports that, in Cháozhōu, "before a high falling tone...[.] (i) high tone becomes low tone, (ii) low tone becomes high tone, and (iii) mid tone remains unchanged." In accordance with the principles of Auto-segmental Phonology (cf. the discussion and references in Appendix II above), this process can be reformulated as the following rule (where the tonal features are capitalized, and "σ" represents a syllable):

\[(9) \begin{array}{c}
\left[ \alpha \text{HIGH} \right] \\
\left[ -\alpha \text{LOW} \right]
\end{array} \rightarrow \begin{array}{c}
\left[ -\alpha \text{HIGH} \right] \\
\left[ \alpha \text{LOW} \right]
\end{array} \text{/} \text{[} [+ \text{HIGH}] \left[ -\text{LOW} \right] \text{]} \sigma\]

Obviously, this operation creates homophony of output segments with input segments only when the members of such segment pairs start out agreeing in all features except their tonal associations, anyway--and so it manifestly fails to satisfy the present definition of exchange rules.

Hence, it was not actually necessary for Anderson and Browne 1973: 463, 479n.8 (cf. also Anderson 1974c:96n.2) to "restrict ... [their] claim [that exchange rules are never purely phonological] ... to the domain of processes affecting segmental features (however these are to be delimited)." Rath-
er, the definition of "exchange rule" which they were implicitly presupposing (cf., again, op. cit., p. 447-448, e.g.) was/is already inherently restricted to segmental phenomena. Tonal same-feature alpha-switching rules are definitely found among the class of well-supported purely phonological rules, then; they just aren't exchange rules (as the latter are being defined here). This conclusion extends, of course, not only to the Cháozhōu case, but also to numerous others.

Thus, Wang 1967:102 interprets Egerod 1956:272 as making a statement to the effect that "such a situation as that of Cháozhou is quite widespread in the Southern Chinese dialects." Wang also reports (1967: 102n.32) that William Merrifield had "recently called ... [his] attention to the existence of a synchronic [tonal] flip-flop in Palantia Chinantec" (an Oto-Manguean language of Central Mexico), and Wang mentions three other possible cases of tonal, acentual, or intonational interchanges--viz., in Korean, as well as in Japanese and British English dialects. (Some of the latter, though, were perhaps never synchronic rules; cf. Wang's references). Furthermore, Bruce Hayes has recently informed me that Loma (a Southwestern Mande language) has high and low tones whose values are reversed vis-à-vis those of their etyma in Proto-Mande. And Herzog 1945:233/1964:320 hints that a similar situation may hold among the Kru languages (or dialects--all members of the Kwa branch of the Niger-Congo subdivision of Niger-Kordofanian). (Again, however, it is not clear whether such historical reversals were ever effected by the addition/creation of an alpha-switching rule to/in a grammar, at any stage).

Lastly, the finding that tone interchange rules by definition can never be exchange rules further supports Anderson and Browne's 1973:448-449 and
Anderson's 1974c:96n.2 rejection of a case proposed by Wolfe 1970:226-227/1972a:137-138/1975a:361-362 as an exchange rule. Wolfe based her example on a report by Herzog 1945:232-233/1964:320 concerning certain high/low tone reversals in the drum-signaling system of the Jabo tribe in Liberia (who speak a dialect of Grebo, a Kru language—cf. the genetic affiliations of Kru given above). In this system, most of the suprasegmental features of the tribe's language—especially tone—can be drummed, and so drummers can broadcast more or less direct analogs of spoken utterances. As a result, Wolfe implies, one must infer that the Jabos understand drummed messages by reference especially to the tonal rules and representations of their language.

Herzog reports, though, that "the right-side lower lip of ... [an old] drum had become quite worn down...[and then--t]o remedy the situation...[--]the drum ... [had,] some years before ... [his arrival,] simply [been] turned around so that a much less used upper lip now became the lower lip. Since the lower lip is thinner than the upper and thus produces higher tones, this operation ... meant that henceforth many low tones were higher, and many high tones lower, than the central tone .... The reversal was not consistent because the pitch-contrasts are often achieved by using different spots on the same lip, or different hand-and-stick positions. The players were undoubtedly saved some feeling of confusion by the fact that their visual and motor experiences remained the same .... [There was a] comparative lack of disturbance at the reversal of the pattern, however...".

From this, Wolfe implies, we must conclude that the Jabos once added a perceptual high/low tone-reversal rule to their grammars for purposes of comprehension. She stresses (1970:226/1972a:137/1975a:361) that su-
prasegmental drum-signaling is "not an arbitrary code, and [that] evidence from such a system is relevant for the study of natural languages."

Anderson and Browne 1973:448-449 (cf. also Anderson 1974c:96n.3) dismiss this case from serious consideration as an exchange rule because "...[f]urther exact 'phonetic' data on the tones involved would be necessary to decide if a real exchange was involved, but in any case there is no obvious reason to expect that the formal properties of such auxiliary modes of communication will accurately reflect those of natural language in every detail." Now, the first of these misgivings can be countered, because Herzog (loc. cit.) reports having made instrumental records of the drum in question. The second misgiving, though, seems better founded, since Herzog 1945: 233-234/1964:320 also reports that "the language of drumming ... [is] highly conventionalized, and the material communicated [is] restricted ...." Furthermore, Herzog earlier (p. 233/320) mentions that "listeners no doubt satisfied themselves with the renewed acknowledgment that '...[i]t is difficult to understand the words of the drums.'"

But it is in fact not necessary to question the status of tone reversal in the comprehension of Jabo drum-signaling as a perceptual same-feature alpha-switching rule--one with purely phonological conditioning. Since that process does not, in any case, systematically interchange the identities of pairs of segments (in exactly the same environment), it is simply not an exchange rule in the present sense. And, in establishing this, we thus eliminate the last alleged tonal counterexample to the claim that there exist no purely phonological exchange-rules in languages--once again, essentially just as a logical consequence of the nature of such processes. If, by definition, they must systematically exchange complete segment identities, that is,
then exchange rules must affect more than only such suprasegmental phenomena as tone; they must manipulate at least some segmental features.


Let us return, then, to instances of segmental operations that have been proposed in the literature as purely phonological exchange-rules—to processes more similar to the Menomini and English examples discussed previously.

One such rule was proposed for both Old and Modern Icelandic by Anderson 1969a:59 [(Vaj), 1969b/1971:24-26 [especially (2.13)], and 1972c: 21-22, 28 [(26, B)]. It can be given roughly as follows:

\[
\begin{array}{c}
V \\
\text{-tense} \\
\text{-high} \\
\text{+round} \\
\text{a} \text{low}
\end{array}
\rightarrow [-\text{a} \text{low}]
\]

This rule performs the exchange (\(u \rightarrow o, o \rightarrow u\)). Its input \(o\)'s are underlying vowels of Icelandic, while its input \(u\)'s are derived from \(a\)'s by a particular formulation of the much-discussed Icelandic rule of ð Umlaut—cf., e.g., Anderson 1969a:56-62, 69-70 [especially (V), (Vc)], 1969b/1971:20-37 [especially (2.12), (2.18)], 1972c:13-24 [especially (12)-(14), (18), (27)], 27-29 [(A)], 1973 (especially pp. 3-4 [(2)]), 1974c:141-146 [especially (5)], 185-189 [(21)-(25)], 191-196, 200-202, 217, 280, 1976, 1979a:15-17, 1980a:5-6, 14.

However, Anderson 1974c:96n.3 retracts this exchange rule analysis, "since it does not really function to account for alternations in morpheme shape, but rather serves [only] to rationalize other such alternations." For one thing, there is little reason to analyze Modern Icelandic surface [\(u\)] as underlying /\(o\)/ rather than /\(u\)/. The motivation for [\(u\)] \(\land\) /\(o\)/ was mainly
that this helped allow both members of the "short"/"long" pair (orthographic) \( \text{o} / \text{ó} = [\text{ɒ}] / [\text{ɒ} \text{\text{"}}] \) to be analyzed as underlying monophthongs with the same height, differing only in their values for [tensē]. And this move permitted "...[c]onsiderable economy" in underlying segment types and feature specifications and in certain other rules (cf. Anderson 1969a:55, 1969b/1971:19). But such considerations of economy no longer seem at all as weighty as they did fifteen or so years ago.

Furthermore, an underlying \( /\text{ɔ}/ \) representation for Modern Icelandic \( [\text{ɒ}] \) is supported by "virtually no alternations in the language" (Anderson 1969b/1971:loc. cit.)--or at most only by "sporadic alternations" (Anderson 1972c:20-21 [(22.d)]). Hence there now appears to be little reason not to derive Modern Icelandic surface \( [\text{ɒ}] \) from underlying \( /\text{ɔ}/ \). But this then eliminates (10) as an exchange rule. In fact, it effectively eliminates (10) as a rule altogether, since--with the loss of the \( \text{o} \rightarrow [\text{ɒ}] \) subrule--it becomes more economical to build the raising of \( \text{a} \) that occurs in conjunction with \( \text{ü} \) Umlaut directly into that latter rule. Thus, (10) now disappears completely from Modern Icelandic.

For Old Icelandic, the motivation for (10) is mostly the same as that just given--scantily--for the modern language, but also partly different. Namely, certain historically unexpected vowel qualities in Modern Icelandic words can be analyzed as lexicalizations of the results from exceptional orderings, in Old Icelandic, of (10) vis-à-vis one or more other rules (cf. Anderson 1969b/1971:25-26, 1972c:22-23). But, since these instances are sporadic and, in any case, exceptional, they are not compelling. After all, one can easily formulate alternative exceptional accounts (i.e., ones not involving Rule (10) above) for such exceptions. Nor does the sporadicity of the latter

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square well with the prediction of generality inherent in (10). It is for reasons such as these, then, that we can follow Anderson 1974c in rejecting his former lowness-reversing exchange-rule (= (10) above) as a bona fide phonological rule of either Old or Modern Icelandic. (Further reasons to reject this rule are given by Benediktsson 1979.)


This then leads us to reconsider--following Anderson and Browne 1973--a number of other processes alleged to be phonological exchange-rules by Wolfe 1970/1972a/1975a (writing just after Anderson 1969a, 1969b/1971).

Let us first scrutinize the case of Modern "Common Czech" (CC), a "popular", "conversational" variety (cf. Anderson and Browne 1973:449-451, as well as Wolfe 1970:222-223/1972a:131-132/1975a:356-357--which grew out of Wolfe 1968--and the references in all these works). Many speakers of Czech control this "Common" dialect in addition to the "Literary Language" (LL)--the standard variety, known to all speakers, which predominates in formal settings. The relation between LL and CC is such that, subject to a number of important caveats and provisos, it is possible to analyze the former as derived from the latter via the operation of several optional phonological rules.

Given that LL [i:] and [e:] correspond, respectively, to CC [e ɨ] and [i:], Wolfe proposes that an exchange rule with the effects \(i: \rightarrow e; e: \rightarrow i:\) is among the set of optional (CC) phonological processes just mentioned (cf. also Kenstowicz and Kisseberth 1979:365-366). This operation is obliga-
torily accompanied by diphthongization and shortening rules which affect the reflex of (LL) /i:/.

Although Wolfe 1970/1972a/1975a does not do so, one would actually (for reasons that will become clear later) have to order both of these other rules after the abovementioned height interchange process in order to maintain a true exchange rule analysis for Czech. In that case, diphthongization and shortening will together convert CC [eː]--from (LL) /iː/--into [e ɪ]. (This overall set of Czech vocalic shifts, is, of course, extremely reminiscent of the overall English Vowel Shift as analyzed by Chomsky and Halle 1968 in SPE and here discussed above.) Anderson and Browne 1973:451-457 (and also Anderson 1974c:96n.3, but cf. the contrasting earlier views in Anderson 1969b/1971:79-81) challenge Wolfe's treatment of CC, however, on the grounds that (LL) /iː/ is not the ultimate source of CC [e ɪ]. Rather, they posit, as the latter's source, an abstract high back unrounded vowel /iː/ (in LL)--which, when it is not lowered and fronted (etc.) to CC [e ɪ], undergoes a fronting rule of absolute neutralization (cf. Kiparsky 1968b/1968c:8-9/1973a:14-15 et passim) that merges it with (LL) /iː/.

Anderson and Browne 1973 justify this analysis by tying it to two facts. First, there are actually some [iː]’s of LL which correspond to CC [iː], rather than CC [e ɪ]. Second, it turns out that only those LL [iː]’s corresponding to CC [iː]’s trigger a rule palatalizing preceding consonants; LL [iː]’s corresponding to CC [e ɪ]’s do not. Anderson and Browne 1973 attribute this to the fact that the latter LL [iː]’s derive from underlying (LL) /iː/. They prefer this analytical tack to that of having no abstract /iː/ (in LL) but instead just marking all non-palatalizing /iː/’s with a negative rule-exception feature.

Here, their reasoning (p. 456) is that, with the latter solution, one "would [not

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only] have to mark all of the non-palatalizing /i:/'s as exceptions to palatalization, ... [but also have to mark] exactly the same set of /i:/'s as exceptions to CC vowel shift. The fact that the same segments are involved in both cases would be unexpressed, and it seems better to attribute both facts (non-palatalization and failure to undergo vowel shift) to the same feature of ... [a] segment's phonological composition. It is exactly in such a case...[-]where two or more kinds of exceptionality are directly related...[-]that the mechanism of exception features is inappropriate and [where postulation of] an abstract segment is indicated."

Nevertheless, this argument ignores the fact that Kiparsky 1968b/1968c:12-13, 41/1973a:19-20, 49 had earlier foreseen exactly this sort of eventuality and already explicitly proposed (and defended) its handling by means of "redundancy rules of the form [- Rule X] &rightarrow; [- Rule Y]" or, even better, [α Rule X] &rightarrow; [(-)α Rule Y]. (This suggestion was later seconded and followed by Robinson 1975b:342-343; on the similar and probably related notion of "redundancy metarules" or "meta-redundancy-rules", see now also Joseph and Janda 1986). With such mechanisms, one can easily and elegantly capture the generalization that [α (CC) Vowel Height Exchange Rule] &rightarrow; [-α (LL/CC) Palatalization Rule]. Hence, Wolfe's 1970/1972a/1975a exchange rule account of the LL/CC [i]:/[e i] and [e:]/[i:] alternations remains a workable and acceptable one at least as regards being able to express the relationship of LL/CC vowel correspondences to (non-)palatalization of preceding consonants. Yet it is vulnerable on other grounds.

First off, there exists at least one easily imaginable alternative to the exchange rule approach initially sketched above. It involves a rule ordering
where the diphthongization in CC [e i] (< LL) /i:/) is altered so as to result from an operation that is performed directly on (LL) /i:/ and is ordered preceding both optional CC Vowel Height Exchange and, finally, Shortening. Thus, (LL) /i:/ → *[i:i] → *[e:i] → [e i]. On this analysis, though, the two subrules of the CC vocalic height interchange process do not constitute an exchange rule, since they are effectively (i:i → e:i, e: → i:).

Now, here, it is true that the CC rule performing the vowel height exchange at issue need not itself mention any environmental neighboring segments in its structural description. For this, consider the reformulation of it immediately below (after Kenstowicz and Kisseberth 1979:366 [(70)], who follow, but do not cite, Wolfe 1968, 1970:223/1972a:141-142/1975a:357-358; cf. also Anderson 1969b/1971:80-81 [(2.5a), (2.6), (2.7)]):

\[
\begin{align*}
(11) \quad & [+\text{long}] \\
& [-\text{back}] \\
& [\alpha\text{high}] \rightarrow [-\alpha\text{high}] \\
\end{align*}
\]

However, this does not alter the fact that, if diphthongization of front high vowels is indeed ordered before rule (11) above, then the two subrules of the latter process will always systematically operate in different environments: (i: → e:/__ i: , e: → i: (context-free)). As a result of this environmental disparity, (11) does not, on this analysis, function as an exchange rule as defined here, because we are restricting that term to processes whose subrules can always both apply in the same phonological context. Since the approach which allows this non-exchange functioning of (11) differs from the first account proposed above essentially only in the ordering of its rules, it would seem to be no less highly valued than that other. And so the front vowel height shifts in CC do not represent a case where
there is a clear need for a phonological exchange-rule.

In addition, the solution with diphthongization preceding rule (11) is clearly preferable to the approach with abstract (LL) /iː/‘s and a rule of absolute neutralization (discussed second, above), since the former analysis does not (as the latter does) involve a violation of the Alternation Condition introduced by Kiparsky 1968b/1968c:8, 11-13, 19-21, 21-26, 30, 32, 33, 37, 43-44/1973a:14, 18, 20, 28-29, 30-32, 37, 39, 41, 45, 51-52, 1973c/1973d: 64-75/1976:166-175 and already discussed here in detail in Chapter V.

In fact, it turns out that Wolfe 1970:223/1972a:141/142/1975a:357, 358 (as well as Anderson 1969b/1971:80) actually adopts an ordering where height exchange (= (11) above) is preceded by diphthongization (of front high vowels)--which, by differentiating the environments of the sub-rules in Rule (11), prevents the latter from functioning as an exchange rule. Consequently, even precisely the analysis of Czech proposed by Wolfe ends up not involving an exchange rule (in the present sense), after all--because, to repeat, the subrules of the process at issue always systematically operate in different environments.

Nevertheless, there is a serious problem inherent in all three of the different alternative analyses just presented--one having to do with the optionality/obligatoriness and the independence/dependence of the CC rules which they posit. One difficulty (already noted by Wolfe 1972b:142-146, 1975b:364-365 herself, based on Wolfe 1971) concerns the fact that, although Rule (11) must be optional, the application of its lowering subrule must obligatorily be accompanied by the other, diphthongization and shortening processes. However, these two rules cannot themselves be obligatory in the absolute, or else they would always apply to LL forms and con-
vert them into CC-like ones—which would have two incorrect consequences. First, an analysis with obligatory diphthongization and shortening would never allow LL /i:/ (or else perhaps /e:/) to be heard (i.e., would never allow it/them to surface unchanged) as a part of one variety of Czech, so that CC [e i] would almost always be heard. And, second, such an analysis might incorrectly derive CC *[i i*] (from (LL) /i:/, when (11) is optionally not applied), as well as [e i] (derived when (11) is applied).

Yet the rules in question cannot all be optional, either, since their individual or tandem non-application to, e.g., (LL) /i:/ (or its reflexes) would result in the surfacing of ungrammatical/unphonological segments (CC *[e:], *[e: i], and *[e], and possibly also *[i: i*], *[i i*], *[i]). Wolfe 1972b:143, 1975b:364 suggests (in the words of the earlier version) considering "the three relevant rules as forming a kind of block.... It is not obligatory to enter the block, but[... once...[it is entered], all applicable rules must be applied."

However, she provides no formal mechanism for incorporating this into a grammar, and offers no independent evidence to support her ad hoc rule block proposal. Indeed, Wolfe 1972b:143 herself finds it "rather a strange condition to impose on a grammar, and certainly ... an extension of the formalism."

Rather, the fact that the diphthongization and shortening rules for CC must obligatorily accompany the optional CC rule (11) should suggest to us another solution—one which actually turns out to be much simpler than the others already sketched. This fourth approach is to have two separate rules for CC: one raising (LL) /e:/ to CC [i:], and a completely independent other one lowering, shortening, and diphthongizing (LL) /i:/ into CC [e i].6

The second process needed here can be given roughly as in (12) below:
The featural economy achieved here (over the other analyses under consideration) results from (12)'s not having to restate the inputs to shortening and diphthongization as part of two—or at least one of two—such separate processes.

More important, though, is the fact that the analysis just proposed is able to avoid a problem (already hinted at above) faced by its competitors—a problem which is in fact much more serious than that of sorting out obligatoryness and optionalness. Namely, if shortening and diphthongization exist as two rules (or even as one rule) separate from optional (CC) lowering—either as optional or as obligatory ones—then they must somehow be blocked from applying alone (= without lowering) to (unshifted LL) /e:/ (on the exchange rule approach initially sketched above) or to /i:/ (on my first alternative approach—which also turned out to be that of Wolfe 1970:223/1972a:141-142/1975a:357, 358, plus Anderson 1969b/1971:80). Otherwise, the two processes in question will incorrectly turn (LL) /e:/ and /i:/, respectively into (CC) *[ei] (and *[e:i], *[e]) or *[i:i] (and *[i:i], *[i]). That is, as also previously observed by Wolfe 1972b:142-143, 1975b:364-365, one crucial generalization about LL/CC front-vowel correspondences is that only raising may apply to (LL) /e:/, and either all of lowering, shortening, and diphthongization apply to (LL) /i:/ (and/or its reflexes) or else none of them do. However, in none of the abovementioned analyses where the latter trio of processes form three (or possibly two) separate rules is there any straightforward, non-ad-hoc way to achieve this.
For example, positing some kind of Kiparskyan redundancy-rule like
\[\alpha (\text{CC}) \text{ Lowering Rule} \leftrightarrow \alpha (\text{CC}) \text{ Shortening Rule} \leftrightarrow \alpha (\text{CC}) \text{ Diphthongization}\] is not a workable solution here. This is because such a device would need to function, not as a way to express a redundancy over rule features listed on vowels in lexical representations, but as a mechanism for determining whether a certain rule or rule set should apply, on the basis of whether some other rule has already applied—or, worse, will later apply. And to mark all (LL) /i:/'s that undergo lowering, shortening, and diphthongization with a rule feature for each—so that the redundancy rule just given would be a bona fide one—is needlessly complex compared to the alternative of marking the relevant /i:/'s for the simpler single rule (12) above, which unites lowering, shortening, and diphthongization.

One must conclude, then, that it is best to split up (and thus reject) the proposed Czech (CC) exchange rule in (11) above and instead to apportion its parts between the two completely separate rules (12) above (for CC [e i], < (LL) /i:/) and (13) below (for CC [i:], < (LL) /e:/):

\[
\begin{align*}
(13) & \quad \begin{bmatrix} +\text{long} \\ -\text{back} \end{bmatrix} \rightarrow [+\text{high}] \\
\end{align*}
\]

The correctness of this solution is clinched by one final fact. Both Wolfe 1970:222-223/1972a/1975a:356-357 and Anderson and Browne 1973:450, following their sources, indicate that (in the words of Wolfe) "in fact Czech[s] ... usually speak in a mixture of the two codes [LL and CC] which ... [one can] term Colloquial Czech (...CL). ... When the ... ["optional phonological rules" from which "CC results"] are sometimes applied and sometimes not, ... [one gets] the normal type of conversational utterance found in
Indeed, Wolfe 1970:229-231/1972a:147/1975a:360-361 goes on to make it clear that any combination of the LL → CC changes being considered here may occur in a single utterance (produced on a single occasion by a single speaker). Thus, for example, one may hear CC [e i:] (from LL /i:/) in one word followed by (unchanged LL) [ei:] in another word, or CC [i:] (from LL /e:/) followed by (unchanged LL) [i:]. Now, if (CC) lowering/shortening/diphthongization (= (12) above) and (CC) raising (= (13) above) are entirely independent optional rules, then we can easily account for the situation just described—in fact, we predict that it should exist. This is not so, however, if we choose, instead, the alpha-switching analysis expressed by (11) above. There, the raising and lowering subrules are treated as forming a unitary rule-schema. Consequently, even if the process in question is optional, either both of its subrules should apply to an utterance, or else neither—but never just exactly one of them.

I have here just made an assumption that, modulo the possibility of the cycle or some equivalent mechanism, phonological rules/derivations—at least postlexical ones—apply to entire sentences/utterances, rather than to individual words, word-by-word. Acceptance of this assumption is not really necessary in order for the present argument to go through, however, since it is actually even possible for Czech speakers to mix CC and LL vowel qualities in a single word. Wolfe 1975b:360 [[(8)]] presents the word for 'former (instrumental plural)'—underlying /bi:vali:mə/—as an example: it can be pronounced as [bi:vali:mə] (LL), [bě:jvalějma] (CC), and [bě:jvali:mə] or [bi:jvalejma] (CL).

There appear to exist several compelling reasons, then, to reject an ex-