Introduction

This book presents a theory of phonology, perhaps the only genuine theory of phonology in existence. Though there are other systems concerned with phonetic problems, none of them can properly be called phonological theories. For example, though phonemic analysis posed as a phonological theory and dominated American linguistics for thirty years, it was not a linguistic theory at all, but a method for achieving an economical orthography. It said nothing about linguistics, only about orthographic systems. Similarly transformational phonetics, which has dominated recent American linguistics, has nothing to say about the actual nature of language, only about the writing system to be used in descriptive statements concerning the observable data of language.

I am not, however, primarily concerned in this book with philosophical aspects of the structure of linguistic theories, but with the exposition of a genuine phonological theory. Since I view phonology as a science, not as the description of phonetic processes, my theoretical system has the structure of a science, with abstract elements and principles governing the behaviour of these elements. Throughout, my approach is to try to understand and explain phonological processes, not merely to describe them.

Transformationalists claim to be engaged in the scientific study of language, but in fact their over-formalized description of superficial data, with no attempt to understand the underlying processes, has little in common with scientific investigation. One cannot therefore criticize my theory in terms of the concepts and ideas of transformational grammar itself. For it is a different system, with different goals and with a different structure.

The concepts of theoretical phonology can be explained independently of other linguistic systems, but I have included a brief criticism of classical transformational phonetics as presented by Chomsky and

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Halle in *The Sound Pattern of English* (*SPE*). I do not include a criticism of post-*SPE* systems because the primary purpose of this book is not criticism but the exposition of a theory, and *SPE* alone is sufficient for the purposes of comparative criticism. The system as presented in *SPE* is readily available and remains the best of its kind, the only one sufficiently developed and sufficiently sophisticated to be worthy of criticism.

Some linguists confuse the terms 'generative phonology' and 'transformational phonology' using the former more general term to refer to transformational generative phonology, as presented for example in *SPE*. Transformational generative phonology is, however, only one type of generative phonology, and other types are conceivable.

Even 'transformational phonology' is an inaccurate term for the system presented in *SPE*, for that system concerns itself not with phonology (the science of the interrelation of abstract elements which manifest themselves customarily as sounds), but with the description of the superficial changes which sounds undergo; this provides valuable data for phonology, but can scarcely be presented as a theory itself. I use the term 'transformational phonetics' for the branch of generative phonology concerned with such a description of sound changes.

I *Philosophical inadequacies of transformational phonetics*

The need for a phonological theory is evident from the failure of transformational phonetics, hitherto the most sophisticated of linguistic systems, to provide a theoretical framework for understanding phonological problems. Chomsky and Halle themselves remark: 'The entire discussion of phonology in this book suffers from a fundamental theoretical inadequacy. Although we do not know how to remedy it fully, we feel that the outlines of a solution can be sketched, at least in part' (*SPE*: 400).

They are correct in sensing that something is wrong with their theory, unduly optimistic however that it can be rectified. The inadequacy is not that certain aspects of the system are wrong, but that the system itself is fundamentally wrong. Though Chomsky and Halle think that ad hoc accretions such as 'marking theory' will remedy the difficulties, in fact the system is unsavable and must be abandoned.

I shall argue that transformational phonetics is vitiated by philosophical errors, three of which are descriptivism, reductionism, and simplicitism. These philosophical errors are not unrelated, but are all basic assumptions of the philosophy of science underlying transformational phonetics. That this philosophy is fundamentally erroneous requires a book-length treatment of its own which I cannot attempt here. In the following sections of this chapter I briefly discuss these philosophical errors. A detailed analysis of some of the linguistic inadequacies resulting from these mistaken assumptions appears in the following chapter. I do not however wish to engage in criticism for the sake of criticism, but to present an alternative, which is found in the remaining chapters.

Throughout my criticism of transformational phonetics I attend not only to what transformationalists say, but also to what they do. For

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example, when I criticize transformationalists for a lack of concern
for universal properties of language, I am not criticizing what they say
(they profess a concern with universals), but what they do as evinced
by their actual analysis of languages (universal statements are neglected
in favour of simpler parochial statements).

Descriptivism

The goal of transformational phonetics is the description of a language
as manifested in the writing of a grammar: 'The goal of the descriptive
study of a language is the construction of a grammar' (*SPE*: 3). Though
Chomsky and Halle claim that 'A grammar is a theory of a language'
(*SPE*: ix), a grammar has always been considered a description of a
language. Transformational phonetics is basically a system of des-
cription; it can legitimately claim little else.

Though Chomsky and Halle perhaps feel that an accurate description
of a language will eventually lead to an understanding of the language,
or even to an understanding of Language (*Syntactic Structures*: 5), this
does not necessarily follow. An accurate description may perhaps
provide insight into the structure of a language, but so might an inac-
curate description. Insight does not arise from description, regardless
of its accuracy, but only from ratiocination. In practice, the concern for
accurate description in *SPE* develops into a concern for writing formally
correct rules, and once these rules are written, the problem is considered
solved, and the investigation stops at precisely the point from which it
should start. Whenever transformationalists could ask a significant
question about language, as 'Why does the laxing rule fail before
dentals?' (*SPE*: 172), they characteristically do not ask the question,
but instead invent another notational device. By contrast the theoretical
approach would inquire why the laxing rule fails before dentals. Theoret-
ical phonology can provide an answer, because it is created to deal with
substantive problems of this nature, in contrast to the descriptive and
notational problems which are the concern of transformationalists.

But why could not transformational phonetics deal with substantive
problems of phonology? Part of the answer is that Chomsky and Halle
do not view phonology as an independent science, but rather 'the
phonological component of the grammar assigns a phonetic inter-
pretation to the syntactic description' (*SPE*: 7). The transformational
attitude is that phonology is a way of translating syntax into phonetics,

and this is achieved through rules whose only requirement is that they
be well formed, not that they have linguistic significance.

Reductionism

The second fundamental philosophical error committed by transforma-
tionalists is reductionism, or the use of subphonological elements in
the construction of a phonological system. In the construction of
a theory, the basic elements must be germane to that theory; just
as the basic elements of a psychological theory must be psychological
elements, so the basic elements of a phonological theory must
be phonological elements. Chomsky and Halle, in attempting to
create a phonological theory based on phonetic elements consequently
commit the reductionist error. A scientific linguistic theory would
be based, not on physical properties of elements, but on abstract
relations.

Conceptually we can recognize two types of features, phonological
features, which refer to the phonological relations, and phonetic features,
which characterize the manifestation of the phonological units as sounds.
This distinction is basic and was made by Chomsky and Halle (*SPE*:
169) yet dismissed by them since they had no concept of phonological
elements other than arbitrary ones such as A, B, C, etc. Within their
theoretical framework they were, perhaps, correct in rejecting the
concept of phonological elements distinct from the phonetic elements,
yet in doing so they were committing a basic philosophical error, thus
assuring that their system would have no theoretical linguistic signific-
ance.

We consider this from two aspects. First, philosophically, a theo-
retical system characteristically distinguishes between theoretical
elements and manifest elements, and a collapsing of this distinction
leads to theoretical impoverishment. Secondly, with particular reference
to phonology, it is not difficult to imagine communication without
sound, for example, by hand movements, by light modulation, or
possibly by telepathy. In all these cases we would be dealing with
abstract relations manifested in ways other than phonetics. Therefore,
in contrast to the transformational position that the basic units are
sounds, is the theoretical position that the basic units of investigation
are the relations among phonological elements, as manifested in
phonological rules. Phonology is not the study of sounds, but the study

of rules. Phonological elements are thus properly defined not in terms of their acoustic or articulatory properties, but in terms of the rules they participate in.

Simplicitism

The third fundamental philosophical error of transformationalists is the reliance on the simplicity criterion. Since this is part of the philosophical basis of transformational phonetics, its validity is never questioned. To take a parallel situation: in planetary astronomy prior to Kepler an important basic assumption was the circularity of planetary orbits. The correctness of this assumption was never questioned, for it was part of the philosophical (or theological) basis of astronomy. This assumption caused endless difficulties, leading to ad hoc accretions in the form of epicycles on deferents, and eventually epicycles on epicycles. The assumption of circular orbits was basically incorrect, and retarded planetary astronomy until Kepler discovered elliptical orbits. The simplicity criterion in transformational phonetics is similarly rigidly adhered to. Yet it is a philosophical error.

A scientific theory is highly valued not primarily because it is simple, but because it is elegant. Simplicity is not objectionable, but it is not fundamental. When it occurs, it should be epiphenomenal to elegance. Simplicity is not bad in itself, but the striving for simplicity is, for all too often it leads to premature closure, the quick and easy conclusion which prevents further investigation which might reveal some universal truth about language.

These three errors are the major philosophical reasons for the failure of transformational phonetics as a theoretical system. Transformational phonetics is impossible to criticize as a theory, for it does not meet the standards of a scientific theory.

2 *Linguistic inadequacies of transformational phonetics*

Although the philosophical errors of transformational phonetics out-
lined in chapter 1 cannot be discussed more fully here, we can see the
inadequacy of these philosophical premises in their linguistic conse-
quences.

   The first four linguistic inadequacies discussed here are listed by
Chomsky and Halle (*SPE*: 400). The last five appear in various places
in *SPE* not as inadequacies, but rather as significant theoretical ad-
vances.

The concept of natural class

The first inadequacy discussed by Chomsky and Halle is that the natural-
ness of classes does not always correlate with the number of features
needed to define the class. They note that: 'Up to a point this measure
gives the desired results, but in many cases it fails completely. For
example, the class of voiced obstruents is, intuitively, more natural
than the class of voiced segments (consonant or vowel), but the latter
has the simpler definition' (*SPE*: 400). Given such a discrepancy bet-
ween what they view as natural classes, and their notational designation
of natural classes, Chomsky and Halle assume that the fault lies in their
notation and that this can be remedied by 'markedness'. I believe,
however, that the discrepancy is not properly blamed on notational
inadequacies, though these certainly exist, but rather on their concept
of natural class. The term 'natural class' is never adequately defined in
SPE, but the following passage gives an indication of how it is to be
understood:

The decision to regard speech sounds as feature complexes rather than as
indivisible entities has been adopted explicitly or implicitly in almost all

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linguistic studies. Specifically, it is almost always taken for granted that phonological segments can be grouped into sets that differ as to their 'natural-ness'. Thus, the sets comprising all vowels or all stops or all continuants are more natural than randomly chosen sets composed of the same number of segment types. No serious discussion of the phonology of a language has ever been done without reference to classes such as vowels, stops or voiceless continuants. On the other hand, any linguist would react with justified skepticism to a grammar that made repeated reference to a class composed of just the four segments [p r y a]. Thus judgments of 'naturalness' are supported empirically by the observation that it is the 'natural' classes that are relevant to the formulation of phonological processes in the most varied languages, though there is no logical necessity for this to be the case. (*SPE*: 335)

Chomsky and Halle are correct in indicating the discrepancy between natural classes and their notational designation. It is, however, their (phonetic) conception of natural class which is at fault, and their attempt to correct the assumed notational inadequacy by their elaborated theory of 'markedness' (another notational device) is thus both philosophically and theoretically irrelevant.

The problem of natural rule

The second inadequacy discussed is that certain rules are 'more to be expected in a grammar' but are, nevertheless, notationally no simpler than rules which are not to be expected in grammars.

This idea, that 'expected' rules should be notationally simpler than unexpected rules, derives from simplicitism, though there would seem to be no intrinsic philosophical reason for this to be true. Chomsky and Halle do, however, raise the general theoretical problem that some rules are judged by linguists to be 'intuitively' more 'natural' than other rules, that is, certain formally possible concatenations of symbols are linguistic rules, while others are not.

A theoretical system which will allow a definition of 'natural' rule is necessary both to distinguish between 'natural' and 'unnatural' rules and to explain why the former are linguistic rules and the latter not. Such a system must include concepts (as for example, the inertial development principle: chapter 7 below) which are more abstract than the rules under study. Unfortunately, transformational phonetics, with its reductionist basis, is not such a system. Examples of natural and unnatural rules in *SPE* (401) may be examined as illustrations of the structure of transformational 'theory'.

(a) It is not obvious to me that

(ai) i → u

is more expected than

(aii) i → ɨ

Philosophically interesting, however, is Chomsky and Halle's notion that the 'naturalness' of a rule is defined by its 'expectedness', that is, by its statistical frequency. This is a shaky basis for determining naturalness of a rule, and is contrary to the theoretical position that the naturalness of a rule is determined by its derivation from a higher order phonological rule in conformity with a phonological principle. For example

g → Ø/V__V

is a natural rule since it is derivable from

C → Ø in weak position

and conforms to the inertial development principle that weakening applies preferentially to weak elements.

(b) It is also not obvious to me that

(bi) t → s

is more natural than

(bii) t → θ

The latter rule occurs in the Germanic consonant shift (Lt *tres*, Eng *three*), and it is difficult to see on what basis Chomsky and Halle expect it to be relatively unexpected.

It might seem that the problem is simply disagreement over naturalness of particular rules. But it is more than that. The claim that one rule is more natural than another should be supported by a theoretical argument; Chomsky and Halle neither provide numbers in support of a statistical argument, nor give theoretical reasons, for preferring (ai) over (aii) or for preferring (bi) over (bii). There seem to be no theoretical reasons for (ai) and (bi) being more expected than (aii) and (bii) and Chomsky and Halle's claim that they are in fact more natural is thus unacceptable. Some sort of evidence should have been produced for the

greater naturalness of (ai) and (bi), for if this claim is not true but nevertheless incorporated in Chomsky and Halle's marking theory (presumably making (ai) and (bi) more natural (less marked) than (aii) and (bii)), it is an internal vitiation of marking theory, in addition to the external irrelevance mentioned above.

(c) In contrast to (a) and (b) I do agree with Chomsky and Halle that

$$\text{(ci)} \quad [+\text{nasal}] \rightarrow \begin{bmatrix} \alpha \text{ ant} \\ \beta \text{ cor} \end{bmatrix} / \underline{\quad} \begin{bmatrix} \alpha \text{ ant} \\ \beta \text{ cor} \\ C \end{bmatrix}$$

is more expected than

$$\text{(cii)} \quad [+\text{nasal}] \rightarrow \begin{bmatrix} +\text{ant} \\ \alpha \text{ cor} \end{bmatrix} / \underline{\quad} [\alpha \text{ cor}]$$

for, even though no theoretical justification is given, this may be found in the fact that (ci) and (cii) are both examples of assimilation, as indicated by the use of Greek variables.

A general condition on assimilation is that it applies preferentially to similar elements, thus for example to *ts* in preference to *ps*, to *kt* in preference to *nt*, and to *nd* in preference to *nt*. Since nasal consonants are more similar to other consonants than nasal consonants are to any segment, we expect assimilation to occur preferentially in the first instance. Though Chomsky and Halle apparently think that (ci) is more 'expected' than (cii) because it is more frequent, this misses the point. It is more 'expected' because of the general conditions on assimilation. Its greater frequency is epiphenomenal to its conformity to the universal condition on assimilation.

Coherent systems of rules

The third inadequacy Chomsky and Halle consider is the inability of their system properly to characterize phonological coherence. They note:

A different type of example is provided by phonological processes which reflect the effect of a coherent system of rules. Thus, in Tswana . . . in position after nasals voiced stops become ejectives, nonobstruent continuants become voiceless aspirated affricates. Cole rightly subsumes these changes under the single heading of 'strengthening'. In the present framework, however, there is no device available that would allow us to bring out formally the fact that these three processes are somehow related. (*SPE*: 401)