THE STRATIFICATIONAL-TRANSFORMATIONAL CONFLICT
AND THEORETICAL ADEQUACY

by

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INTRODUCTION

True to the saying that inspiration strikes in many places simul-
taneously, when Noam Chomsky was developing transformational theory, which
would catapult linguistic science into a confrontation with the problems of
scientific adequacy, linguists such as Sydney Lamb and H. A. Gleason, Jr.,
were developing stratificational theory. They, too, were interested in
coming to terms with the notion of a precisely-defined theory, but assumed
different premises and chose a different notation system. Hence the two
theories were quite dissimilar.

Both also trace their line of descent to forgotten linguists and
attempt to revive some of the possibly fruitful speculation of the pre-
taxonomic era. While Chomsky claims to have been inspired by linguists
existing as far back as the Cartesians (Chomsky, 1965:6-7), much of the
stratificational impulse seems to have come from the works of the Danish
scholar Hjelmslev (White, 1969:192 and Lamb, 1966a).

The process of development pursued by the transformationalists was
to propose devices that would explain the linguistic facts, especially
universal linguistic facts, present in the data. But to this basic purpose
of notation, the stratificationalists added a new concern: their devices were
contrived to resemble the constraints believed to be imposed by the brain.
This approach created an interesting and exasperating quirk in the arguments
between these theories. To the transformationalists, devices achieved
validity through their ability to explain. But for the stratificationalists,
devices could have an overriding validity of their own apart from all

explanation. As a result, no transformational formulation could be viewed as adequate in their eyes, since the system used to achieve the explanation was "cognitively unreal."

As can be expected, from the outset the arguments and defenses have necessarily gone past each other, growing more and more heated. While transformationalists have attempted to point out theoretical and empirical failings in the stratificational approach, the stratificationalists in turn have rejected off-hand or ignored the arguments coming from this sector, clinging to the privileged position of a "real" system. In Current Issues in Linguistic Theory (1964), Chomsky seriously undermines any notion of a phonemic level, showing its incompatibility with the goals of scientific explanation. In the same year, Lamb, in Alternation, Transformation, Realization and Stratification, attacked the whole concept of process notation and ordered rules, charging it with unnaturalness. In 1965, Chomsky replied to the attack, in Some Controversial Questions in Phonological Theory, showing that the stratificational system of writing rules was unable to distinguish between sets of similar and nonsimilar rules, and hence could not achieve explanatory adequacy. Stratificationalists have never acknowledged these criticisms nor revised their theory so as to make them inapplicable, as far as any published material is concerned. Thus despite the defense put up by Chomsky in 1965, stratificational grammar is making essentially the same attacks on transformational grammar today.

In 1966, Lamb's Prolegomena to a Theory of Phonology reinstated the phonemic level with a new analysis, meant to also show the inappropriateness of transformational formulation which found it necessary to leave out this level. In 1968, Postal's Aspects of Phonological Theory discussed the

deficiencies and ad hoc nature of this analysis, as well as pointing out other areas of inadequacy in stratificational theory in general. But the discussions of Postal's arguments by stratificationalists have never dealt with the important points raised.

Indeed, the general stratificational response to criticism has been nonproductive. The tendency has been to hold up as ridiculous the basic transformational formulations:

> It becomes apparent that Lamb's observations a propos of his review of Chomsky's Aspects of the theory of syntax (Lamb 1967) that Aspects will go down in the history of linguistics as the reductio ad absurdum of process description in synchronic linguistics . . . was much too optimistic: the 470 pages of The sound pattern of English (Chomsky and Halle 1968), with Postal's polemic commentary following in its steps, are now the leading candidates for that privileged position in our science. (Makkai, 1972:73)

And, similarly, in the introductory section of Epilegomena to a Theory of Language, 1966, Lamb sets up the three awful categories of closed-minded linguists, neatly implying the sectarianism of transformationalists (and hence inability on their part to see any worth in a competing theory), while also implying the general virtue of the bruised but struggling stratificationalists.

As a result, the inter-theory controversy has proceeded more like a Holy War than a scientific argument. Unassailable truths have rebounded off others, and seldom is seen that response to conscientious criticism which results in progress. One explanation of this entertaining but unproductive phenomenon is the tendency of some of the transformational arguments to be buried in complex analyses that involve other, purely transformational, concerns; hence the criticisms are vitiated. On the other hand, the stratificational point of view about their theory, that it is endowed with some

greater than average reality, draws them away from making the kind of forceful empirical arguments that could truly falsify the transformational position.

The following discussion brings together the various stratificational arguments and discusses their validity in the light of basic logical requirements for theory construction. It hopes to make clear that insofar as this theory departs from these requirements, without which no theory can hope to attain a position of adequacy, and just because it has departed from these requirements, the stratificational formulation has not arrived at the ability to explain or accurately predict linguistic events.

THE FORMULATION OF SCIENTIFIC THEORY

As sciences mature, they progress from the stage of collecting bodies of data to explaining the data. This amounts to forming a hypothesis about some phenomenon, a hypothesis which may come through a burst of inspiration, a dream, or studies of old masters. The discovery process itself is illogical, but as the idea is logically tested it unfolds into a theory. Predictions are deduced from the hypothesis and tested against the data. As more and more predictions are supported, the theory strengthens; if they are falsified, the theory weakens. Needless to say, the theory must be precisely stated in order to determine just what its predictions are and what tests will evaluate it. The basic guidelines for the precise and logical formulation of theories are generalization, falsification, and simplicity.

The goal of a theory is to explain, which is equivalent to capturing generalizations. For the goal to be reached, it must not be supplanted by other goals or undermined by notions that run counter to it. Thus it is a primary assumption in science that the world is law-like; laws or generalizations exist to be discovered. The data will be expected to behave in some rational manner: similar items will be expected to undergo similar processes; dissimilar items will be expected to pattern differently. Clearly no generalizations can be abstracted from purely random data; hence no theory can be constructed. Karl Popper in his well-known work The Logic of Scientific Discovery (1968:61) illumines this by saying:

> . . . we are not to abandon the search for universal laws
> and for a coherent theoretical system, nor ever give up
> our attempts to explain causally any kind of event we
> can describe.

Left to itself, generalization can degenerate to speculation. To prevent this, a theory must also meet the condition of falsifiability. This requires the theory to provide some clear predictions about the data which are testable.

> . . . a criterion for a theory is that it should be falsifiable by empirical tests. (Hesse, 1966:35-36)

Popper explains falsifiability by indicating that a theory must describe two sets: the set with which its predictions agree, and the set which it contradicts. This latter group is the class of "potential falsifiers":

> . . . a theory is falsifiable if the class of its potential falsifiers is not empty. (1968:86)

A theory which fails the condition of falsifiability is too far from the data to be of explanatory value. It does not separate the field in question from other possible fields, and hence is vacuous. Thus by requiring a theory to be testable we insure that the generalizations will be closely patterned onto the world tested.

> Thus we may perhaps identify the degree of strictness of a theory--the degree, as it were, to which a theory imposes the rigour of law upon nature--with its degree of falsifiability . . . (Popper, 1968:141)

To guarantee that the theory clearly specifies and characterizes the field of study, falsifiability is carried as far as possible, without losing generalizations. Thus the best theory achieves a balance between the extremes of vacuous generalization and mechanical testing of observed facts.

> Theories are nets cast to catch what we call 'the world': to rationalize, to explain, and to master it. We endeavor to make the mesh ever finer and finer. (Popper, 1968:59)

The most adequately constrained theory has hypotheses, axioms and devices which are not only sufficient to account for all the regularities of the data, but are also necessary, containing no superfluous conceptions.

The attempt is made to collect all the assumptions which are needed, but no more, to form the apex of the system. (Popper, 1968:71)

We would like to choose the formulation that within the same constrained framework, provides the most explanation. Thus the notation is devised to provide a measure of the degree of generalization in any statement: this is called simplicity.

. . . a more universal statement can take the place of many less universal ones, and for that reason has often been called 'simpler.' (Popper, 1968:142)

. . . it becomes clear what the concept of simplicity is actually expected to achieve: it is to provide a measure of the degree of law-likeness or regularity of events. (Popper, 1968:138)

Simplicity is sometimes so inflated in importance that it eclipses the goal of theory-construction, itself--generalization. Almost any system can be simplified in some manner or another; but such a simpler statement is of no value unless it also corresponds to greater explanation. Clearly the notation must be carefully constructed so that simplicity is really indicative of value, or it may obscure true generalizations and lead to a mass of useless machinery.

A theory that incorporates these considerations has a good foundation from which to contribute to scientific knowledge. The attitude of the researcher, however, is important in allowing this development. The theory must be willingly held up to each of its potential falsifiers.

We choose the theory which best holds its own in competition with other theories; the one which, by natural selection, proves itself the fittest to survive. This will be the one which not only has hitherto stood up to the severest tests, but the one which is also testable in the most rigorous way. A theory is a tool which we test by applying it, and which we judge as to its fitness by the results of its applications. (Popper, 1968:108)

Thus the scientist must pursue truth, even if it contradicts his hypothesis, for even in the falsification of a theory a great deal about the data is learned.

> The point is that, whenever we propose a solution
> to a problem, we ought to try as hard as we can to
> overthrow our solution, rather than defend it.
> (Popper, 1968:16)

Certain attitudes, all too common in reality, prevent this rigorous testing and advance of knowledge:

> . . . but those who uphold it dogmatically--believing
> perhaps, that it is their business to defend such a
> successful system against criticism as long as it is
> not conclusively disproved--are adopting the very
> reverse of that critical attitude which in my view is
> the proper one for the scientist. (Popper, 1968:50)

Conclusive disproof is nearly impossible. There are always political maneuvers to avoid facing criticism: the attempt to attain a privileged and untouchable position via tradition, intuition or conviction; arbitrary decisions to limit the admissible data to what our theory can handle; or nonrecognition of criticism and its implications. But all these ploys remove the system from the consequences of empirical demonstrations, which effectively empties its class of falsifiers, rendering the theory beyond discussion and thus vacuous.

> . . . a subjective experience, or a feeling of conviction
> can never justify a scientific statement . . .
> (Popper, 1968:46)

It is important to realize that the notions of generalization, simplicity, and falsifiability are not just theoretical niceties but are absolutely necessary for the adequate development of a theory. Without one or the other of these principles, the theory will fall into some kind of emptiness. Without falsifiability, the theory will become so vast as to blur together all

explanations and finally dissolve itself in the totality of reality. Without simplicity there is no method of separating law-like from arbitrary. Without the supreme goal of generalization, the theory has no ability to explain and thus fails its purpose.

Linguistics and Theory

The requirements for linguistic theory as expressed by Chomsky in his levels of adequacy (Chomsky, 1964:28) are well motivated in terms of the principles discussed above.

(1) The level of observational adequacy. Here the data is organized into convenient lists. It reaches the maximum in terms of falsifiability, but is missing the notion of generalization. Such a grammar has no explanatory power and is of little theoretical interest.

(2) The level of descriptive adequacy. At this level the linguist attempts to capture the intuitions of the speaker about his language. He becomes concerned with linguistically significant generalizations and thus begins to make interesting statements about a language.

(3) The level of explanatory adequacy. Here the notational system is so constructed that the descriptively adequate grammar with the most generalizations will be given highest value. At this level, the principle of simplicity is incorporated and a precise theory constructed.

Transformationalists have attempted to provide for the conditions of explanatory adequacy. Apparently stratificationalists, too, recognize its importance:

> Stratificational linguistics has emphasized the importance of an evaluation measure for linguistic description . . . . (Lockwood, 1972a:264)

The principle of falsifiability and constrainedness is also explicitly recognized:

> However, a formal notation cannot claim to provide an explanation until it not only is rich enough to express the generalizations, but its expressive power is also limited in such a way that the notation cannot be used to express generalizations that could not hold in real languages. (Kiparsky, 1972:218)

> The relevant principle is the one which requires the minimal conceptual elaboration consistent with the domain of facts, that is, the principle which says in effect that each piece of theoretical machinery needs to be justified. (Postal, 1972:136)

At least in principle, linguistic science is in accord with scientific principles in general. Of course there is a long step between recognition and application of principles, and the scientist must constantly be on guard against subverting the logical process of theory formation.

STRATIFICATIONAL AND TRANSFORMATIONAL THEORY

Goals of the Theories

There is a claim that the goals of transformational grammar (TG) and stratificational grammar (SG) are not comparable. In this view, the theories are not rivals or competitors but seek to describe different aspects about language.

> . . . the two theories, stratificational and trans-
> formational, are seen to be not so much incompatible
> with as irrelevant to one another. One may reasonably
> criticise either theory on the grounds that it does not
> fulfill its goals, or on the grounds that there is some-
> thing inherently inappropriate about its goals. It is
> not reasonable to criticise either theory for failing
> to fulfill the goals of the other. . . . There seems no
> reason why the two theories should not co-exist peace-
> fully. (Sampson, 1970:10-11)

This belief seems to involve two arguments: SG is not interested in characterizing the notion 'grammatical sentence'; and SG is a performance model.

About grammaticality, Sampson states:

> He [Postal] misses the point that the main purpose of a
> stratificational grammar is not to generate all and only the
> utterances of the language in question, but rather to provide
> the correct realisation for any content or expression struc-
> ture which is appropriate for the language . . . so the case
> with a stratificational grammar that the input is an anoma-
> lous content structure is, as it were, a 'don't-care state.'
> (1970:11, n3)

SG is concerned with being able to produce the creatively anomalous and not strictly grammatical utterances that a speaker may utter. On the other hand, the transformational notion of competence does not prohibit strictly ungrammatical utterances but is concerned with explicitly

characterizing a speaker's intuitions about "grammatical sentence of the
language." A grammar's ability to distinguish a sentence of the language
is quite a basic requirement. Whatever might be said about the unimportance
of grammaticality in SG, the presence of tactic rules which specify a well-
formed sentence indicates that this concern is present.

If SG were a performance model, its plane of reference and data of
study would differ considerably from that of TG. We might expect the systems
to be mutually compatible, able to co-exist since they describe different
aspects of language. However, the two theories do overlap and make signifi-
cantly different claims about the same aspects of language. Thus we find
that SG, like TG, is interested in explaining the underlying competence of
the speaker.

> From analyzing such data [samples of speech - writing]
> he must try to construct a representation of the system of
> relationships which underlies it . . . . Thus the goal of
> a linguistic description should be a characterization, as
> precise as possible, of the structural relationships which
> underlie the linguistic data. (Lamb, 1966c:3)

> It then becomes interesting to view such linguistic and
> cognitive networks as models of the knowledge, or of some
> of the knowledge, that a typical human being has stored in
> his brain. (Lamb, 1970:195)

Indeed, stratificationalists have accused transformationalists of
not maintaining the competence-performance distinction, which clearly indicates
the importance of competence in SG:

> . . . one of the reasons for the excessive ordering
> of rules found in mutational descriptions is the failure
> of that framework to separate the linguistic information
> from the operations for using the information.
> (Lamb, 1972:676)

Transformationalists have described competence without reference to
the mechanism for its activation in encoding and decoding, perhaps feeling

such goals were premature. Stratificationalists, however, set themselves

the additional goal of constructing a theory of competence which can also

be directly activated to provide for ideal performance. Perhaps from this

comes the notion that SG is a performance theory.

> Their knowledge of their language, their internal
> linguistic information system, is a competence to
> perform. (Lamb, 1971:14)

In their goal to characterize the system of rules (or relationships)

which language must have access to in order to produce utterances, these two

theories coincide. SG would also like to make this competence directly

productive. Even so, the actual system is a construction of competence, and

the value of the performative aspect is directly related to the theory's

ability to describe linguistic competence.

The Stratificational Model

An illustration of one version of the stratificational model is

presented in Figure 1 (Lockwood, 1972a). Immediately striking is its three-

dimensional character. The vertical plane represents the realization portion

which is divided into four levels (alternate models have presented as many

as six levels). The levels, or strata, each have an attendant horizontal

plane, called the tactics. In the realization portion, composition and

alternation is depicted. Thus an item of a higher level may be realized by

or composed of several lower level forms; or separate items may collapse or

neutralize and thus be represented by only one item on a lower level. For

example, the sememic level entity 'big' is associated with two lexemic repre-

sentations: 'big' and 'large.' Thus the realization plane accounts for the

fact that certain forms are partially synonymous. If a form has several

meanings, is ambiguous, it must be considered to derive from, or realize,
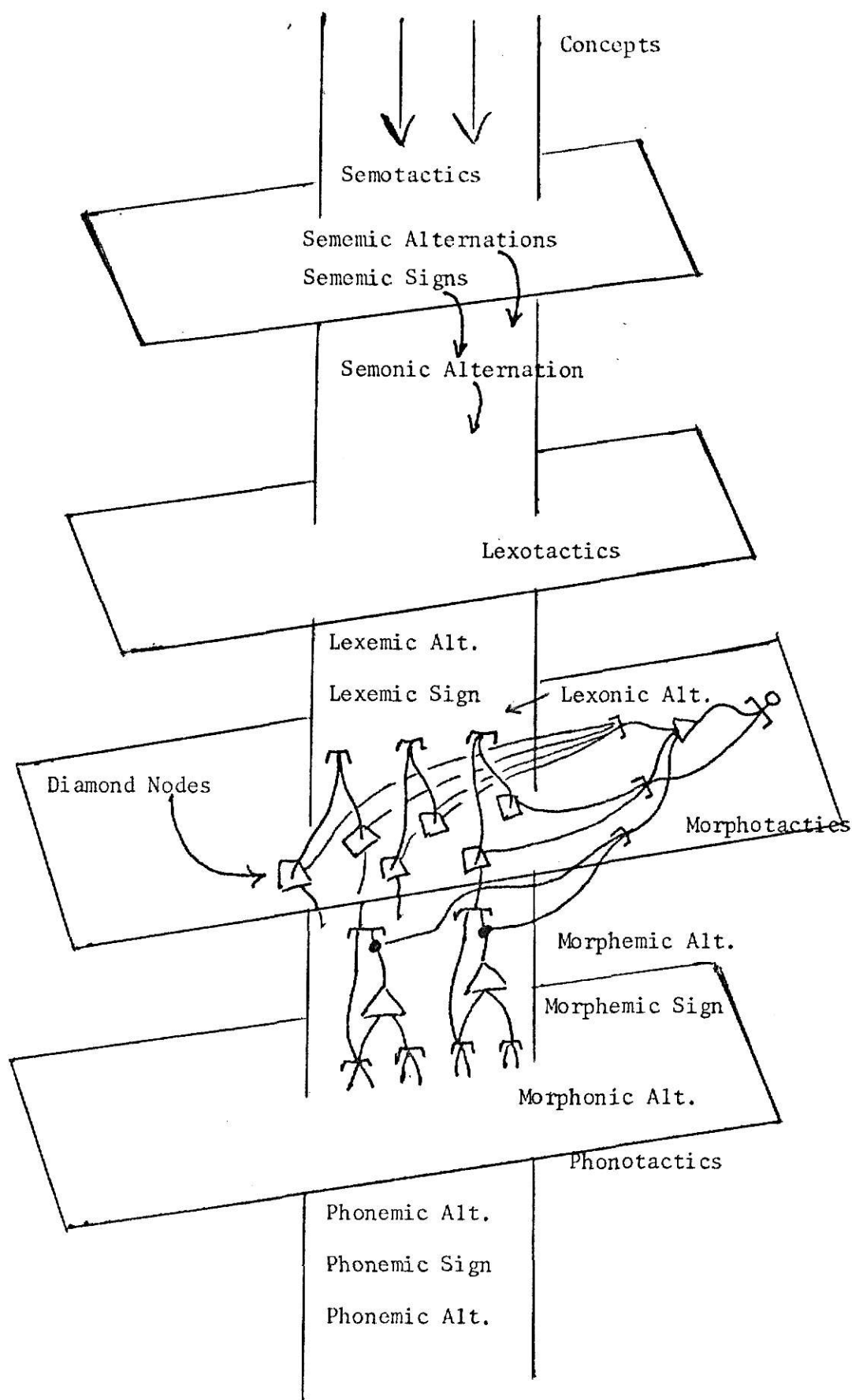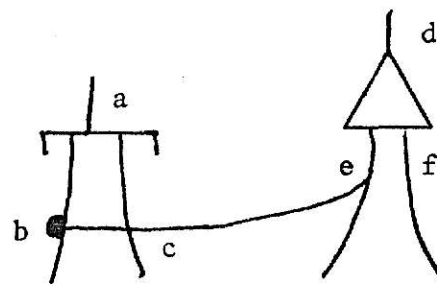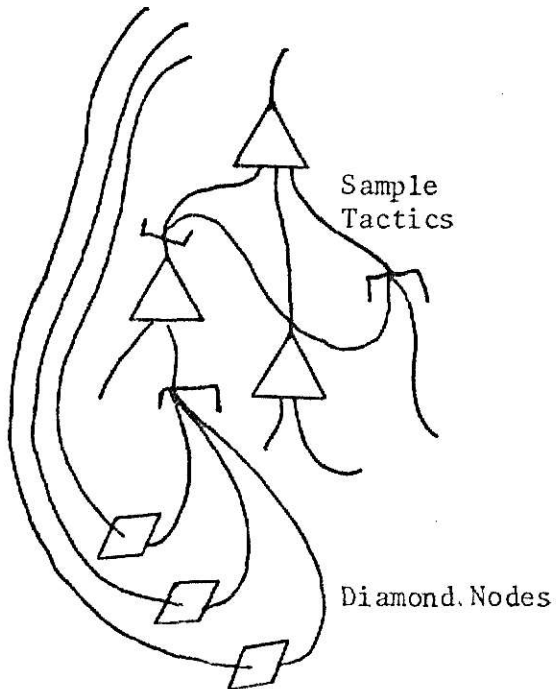
The Stratificational Model

FIGURE 1

several higher level underlying entities. The tactics of each level specifies the correct ordering for that level. That English sentences are divided into subject and predicate, that classes of nouns appear in the subject and object positions, that verbs appear in the position following the subject, will all be specified in the tactics.

To represent these various connections, the model uses a network system. The network is made up of lines which can enter several kinds of terminals. The possible terminals or nodes are represented in Figure 2. To indicate that one underlying form is realized as two alternate forms, the 'unordered or' is used. The line entering from the top represents the single underlying higher entity, and the two lines emerging from the bottom indicate that the system can choose either of two separate paths. Composition can be indicated by an 'unordered and' node, which is triangular. This terminal specifies that both paths must be taken. Also available are ordered 'ors' and 'ands.' These are represented by a slight separation in the output lines and indicate in the case of 'ands' that both paths must be taken, and in that order; and in the case of 'ors,' the first path must be taken first; if it cannot apply, then the second path must be taken. The 'ordered or' is often connected to a conditioning environment by an 'enabler' which is simply a line drawn from one leg of the 'or' to a line emerging from the terminal which represents the conditioning environment. The enabling line indicates that the leg of the 'or' it is attached to can only be taken if the conditioning environment has also been chosen.

It is important to keep in mind that the various lines and nodes in a realization or tactic pattern have no phonetic or concrete meaning. They are unanalyzed abstract entities; any concrete labels are simply added for the reader's convenience and represent what the eventual realization of the

unordered 'or' unordered 'and' ordered 'or' ordered 'and'

a/b,c   a/b.c   a/b+c   a/b c
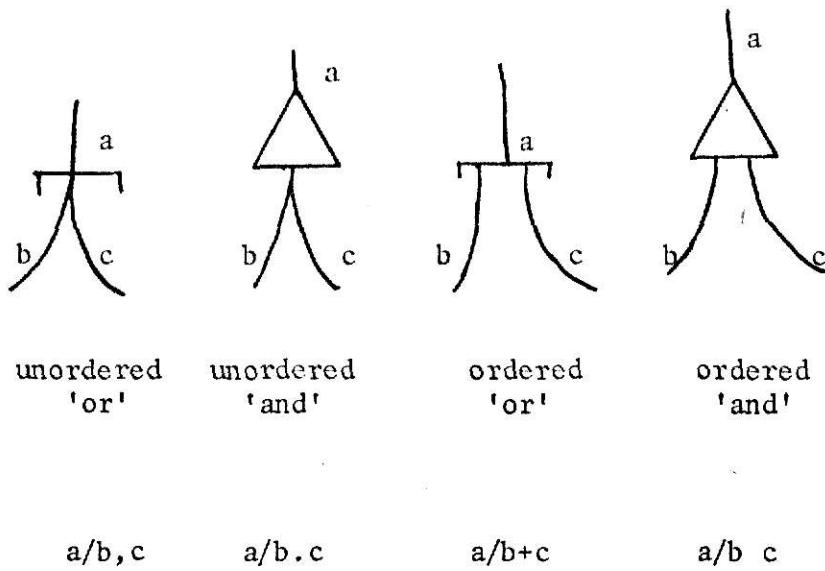
Realization Paths
to Higher Levels

Sample
Tactics

Diamond Nodes

ordered 'or' with enabler

$$a \| \underline{\quad} e/b + \| \text{---}/c$$

(a in environment of following e is realized
as b and otherwise as c)

FIGURE 2

form will be.

The various patterns appear in the system as follows: the tactic patterns are arranged hierarchically, with the output of one node becoming the input to another. This somewhat resembles, in graphic form, a phrase-structure grammar that begins with 'S' and through gradual splitting and recombination, arrives at the specified order of the string. At the point where a tactics must list the class membership of a level (that is, for example, where the node corresponding to Noun must allow through an unordered 'or' the possibility of choosing anything in the set 'noun'), it is connected to the realization section through a series of diamond nodes. The diamond nodes represent the units of that level; there will be, then, one for each noun on the appropriate level. The diamonds are connected through the upward side to the next higher realization level which will indicate which particular noun has been chosen in the realm of meaning. The sidewise connection to the tactic pattern represents the ordering relationships that noun must follow, where it can appear in the utterance. The diamond is also likely to be connected downward to the next lower level where, if it is a morpheme-diamond, it will participate in alternations specifying the combinations of phonemes which compose it.

The portion of the realization plane immediately below the tactics is called the alternation pattern. This particular pattern is characterized to a great extent by various kinds of 'ors' attached to the lower edge of the diamond node. These 'ors' are also often connected by means of enablers to various conditioning environments in the tactics. These enablers do not go through diamond nodes, but represent completely determined choices which are the result of purely tactic considerations and not comparable to the

meaningful choices of the realization portion.

There is also an alternation pattern above each tactics. The alternation pattern above the morphotactics is called the lexonic alternation system. Likewise, these alternations are conditioned by the morphotactics. The difference between the two alternation patterns is summed up by Lockwood:

> A lexonic alternation, for example, will occur when a lexon is realized by alternate morphemes with a conditioning environment stated in terms of morphemes. A morphemic alternation, on the other hand, will occur when a morpheme is realized by alternate morphemic signs, with its conditioning environment likewise stated in terms of morphemes. We may thus speak of -onic alternations as output-conditioned, and of -emic alternations as input-conditioned. (Lockwood, 1972a:121)

Below the -emic alternation on each level is a sign pattern. The output of the alternation pattern enters a series of ordered 'and' nodes, that specify the combination of the units of that stratum in terms of minimal units of the same stratum. The output of this system is the -ons (morphons, lexons). On the morphemic level these are comparable to morphophonemes.

Thus the stratificational system can be viewed as a sort of step-down arrangement. A series of items are arranged according to their ordering restrictions. Then each item is connected to its various conditioned alternants (go-went-gone) at the same level. Each possible item is then specified as being composed of a series of minimal units, similar in size to the next lower level, but with their arrangement determined by their own level. These minimal units can then be split into various alternants and are finally rearranged according to the ordering restrictions of the lower level. This system corresponds to static structure in the brain. When speech is produced, the lines are thought of as conveyors of a signal or impulse which travels through the terminals, performing the functions they describe.

SG contains additional terminal and connection types for specialized concerns. This simplified view is presented to give some idea of the surface difference between SG and TG.

THE STRATIFICATIONAL CHALLENGE

The stratificational attack against transformational grammar can be classified into four main arguments:

1. SG is simpler.

2. TG is conceptually impossible because its notational system is inappropriate.

3. TG misses generalizations by not using strata; namely, generalizations which allow and require a phonemic level.

4. TG misuses ordering; therefore any generalizations it appears to present are mere notational artifices.

The Simplicity Argument

Stratificationalists claim that their theory is simpler than TG. Since simplicity is a measure of theoretical adequacy, the argument goes, SG is to be preferred. In his review of Introduction to Stratificational Linguistics, Sampson says:

> One great advantage of Lamb's theory over Chomsky's
> is that it is much the simpler. (1974:236)

This argument can be understood in three ways. First, it might be taken to refer to some belief that SG is easier to read, takes less paper, or is easier to program on a computer. Since none of these notions of simplicity are related to capturing generalizations, this argument is irrelevant. This is not, however, the simplicity argument stratificationalists have in mind.

Second, simplicity as a measure of generalizations can be imagined to yield a lower, and thus higher-valued, count for SG than for TG. This

concept of 'simpler theory' is apparently applied by stratificationalists on occasion. For example, Lamb says:

> In the case of mutation rules, on the other hand, <u>a separate pass must be made through the string for each rule</u>. (1964:115)

Also, Lamb argues that ordered rules must each contain an integer indicating the rule's position in the sequence (1964:114). This integer must be counted and thus complicates an ordered system.

This argument is erroneous, for simplicity as a measurement of generalizations must be built into a particular notation system. If two formulations using the same notation are compared, the simplicity count attached to the system will choose the more general one. But the stratificational and transformational notation systems are quite different. Hence the simplicity notions relevant to one theory have no validity when applied to the other.

Since it is a theory-dependent measure, simplicity implies no general notion of cost of devices. We expect that the linguistic system has certain natural techniques for bringing together generalizations and producing simplicity. The simplicity count will indicate whether the techniques were able to apply. A less valued rule will be one with no strong generalization to be expressed, and hence fewer of the simplifying devices of the theory will have been able to operate on it. In TG, ordering has been discovered to be such a natural technique. It abstracts certain generalizations; thus the system will naturally be simpler when it applies. Similarly, SG values strata. These levels are not themselves counted by the simplicity measure, since they are the natural means of expressing generalizations.

For stratificationalists to require transformationalists to count

ordering is really a statement that ordering is not natural since it is not a significant factor in SG. This amounts to requiring rival theories to devalue themselves in just those ways they differ from SG. As a result, any sequence of stratificational rules will always be simpler than a sequence in any other theory. Such application of the simplicity measure is nonsense. It simply affords a privileged position to SG. What is needed, instead, is a demonstration that the transformational devices do not correspond to real generalizations.

The third type of simplicity argument is that SG is more conceptually constrained than TG, without losing generalizations. This argument derives directly from the 'sufficient and necessary' doctrine of science and is the notion of simplicity most often meant in stratificational criticisms. Lockwood states:

> Stratificationalists have sought to develop a system of grammatical description for which a simple procedure will achieve the desired results. This search has led to the development of a system by which the phenomena of various strata are describable with a relatively small inventory of basic relationships. (1972a:265)

Again, Sampson declares the more constrained nature of SG:

> What matters is 'objective-descriptional simplicity' - fewness and simplicity of the kinds of theoretical entity recognized, and the like - and here Lamb's theory scores noticeably. (1974:237)

Though theoretically valid, such a criticism is difficult to apply. A detailed comparison of the two theories shows that each have added a great deal of supporting machinery. SG has included devices such as recursive loops, subscripts, enablers and markedness. A complete list of all the transformational and stratificational devices could be compared, but there is no way of judging the value of the devices in relation to each other.

Is a stratum equal in cost to a transformation? Is the notion disjunctive-conjunctive ordering equal in value to ordered 'ors' and 'ands'? The only answers could come from positions of preference and bias; the argument would be endless.

An argument from the basis of constrainedness will only be effective when the two theories are closely alligned, except that one includes an extra device. It would be easy to see which theory had the extra complexity, and that theory would be required to show that the additional complication was necessary to adequately explain language. But SG and TG are not alligned in any such simple way.

Even if stratificationalists are given their point that, according to some vague convictions, their theory is more restricted, this is not in itself an effective criticism. The greater complexity of TG may stem from greater explanatory adequacy. Clearly a theory that elects not to consider certain features of language will be to this extent simpler, even if less adequate.

> Notice that it is often a step forward, then, when
> linguistic theory becomes more complex, more articulated
> and refined . . . (Chomsky, 1972:67)

The more complex system must, of course, prove it accounts for more aspects of linguistic behavior than its rival. TG has concerned itself with issues of natural class and linguistic universals not considered within SG. If these represent advances in knowledge about human language, then the supposed greater complexity of TG is justified.

Thus the comparative simplicity of these two theories becomes a pointless argument. There is no particularly interesting way of determining which one is more constrained. Even if there were such a demonstration, the

point would immediately be raised that the simplicity represented a failure to account fully for linguistic phenomena; and hence the debate would not be settled.

The Reality Argument

The second major criticism by SG claims that the transformational notational devices are inappropriate to describe language. This argument breaks down into three subtopics:

1. TG is unlike the brain.

2. The use of process notation is inappropriate.

3. Positing concrete phonological 'stuff' in underlying representations is conceptually improbable.

Transformational grammar and the brain. Stratificationalists present a notion of 'cognitive reality.' Apparently this refers to the behavior of the brain and amounts to a claim that the conceptual devices should represent apparatus that could occur in the physiological linguistic system. After surveying the known features of the brain, stratificationalists based their system on the following: the brain consists of neurons and synapses; neurons signal by impulses of a few known types; stored information is part of the static framework and appears to be kept in the connectivity of the network; several nerves can fire impulses simultaneously (Reich, 1967:88). Indeed, the brain apparently makes use of what seems to be a network. Thus the stratificationalists have concluded:

> Linguistic behavior shall be modeled by building
> networks out of a few types of formally defined elements.
> (Reich, 1967:87)

Because the brain stores its information in a network, the notational system in a linguistic theory, according to SG, should represent

generalizations by means of a network. There can be no rules that express

operations on elements in the stratificational conception, only connections

between elements. Thus changes and relations are accomplished by following

pathways, rather like a circuitry diagram.

> . . . the entire linguistic system consists of just
> relationships - not symbols and relationships, just
> relationships, which may be diagrammed in a network
> of lines and nodes. (Lamb, 1970:204)

> If we conceive of language as a code relating concep-
> tual correlations to phonic correlations, it is a small
> step to the conclusion that a language is a system of
> relationships. It is a fundamental tenet of stratifi-
> cational linguistics that relationships form the most
> appropriate characterizations of a language.
> (Lockwood, 1972a:3)

Stratificationalists conclude that being similar to the brain in

these ways gives their theory greater validity:

> When he eventually came to inquire about the relation
> of his model to the brain, Lamb found that the linguistic
> networks he was working with had several points in common
> with the networks of neural connections which, it is
> agreed by specialists, exist in the brain. (Lockwood,
> 1972a:5)

Thus the stratificational system is held up as more than a metaphor

of underlying reality, but is something near to reality itself:

> Lamb, however, while agreeing that a process statement in
> a synchronic description is sheer fiction, believes that
> the stratal description he offers as an alternative to it
> is more than simple metaphor - is, in fact, an analog to
> structural differences in the brain involved in speech
> production and perception. (Algeo, 1969:9)

These notational requirements imposed on linguistic theory by strati-

ficationalists are justified by what they consider the logical theoretical

approach to modelling:

> The most fruitful approach to the study of a system
> which we can observe only through its indirect manifesta-
> tions involves a procedure known as modelling. This

procedure is implemented by constructing hypothetical
systems known as models. In constructing these models,
we try to make their behavior parallel the observable
behavior of the unobservable system as closely as
possible. Underlying this method of investigation is
the assumption that the more closely the behavior of a
model approximates that of the unobservable system under
investigation, the closer the internal workings of the
model can be expected to correspond to the internal
structure of the actual system. (Lockwood, 1972a: 4)

Apparently, the stratificational belief is that a system which out-
wardly conforms to the subject studied must necessarily contain the most
significant generalizations. Given this position, TG can be ruled out on
its surface appearance. It bears little resemblance to a neuron or synapse;
thus by this reasoning it can have no explanatory power.

As a result, we have been presented with purported
competence models with an organization which could not
conceivably bear the slightest resemblance to the system
the speaker has in his brain . . . (Lockwood, 1972a:9)

The chief reason for its [TG's] failure is, in the
opinion of stratificationalists, connected with its
insistance on a formalism which is basically inappropriate
for the characterization of the structure of human
language. (Lockwood, 1972a:11)

The goal of scientific theories, as we have seen, is the explanation
of phenomena. The notational system is subservient to this purpose. Hence
the better notational system is that one which presents and values more
generalizations. Such a system is assumed to capture more of the underlying
reality of the data. There is no consideration of what the notation system
should look like. For the stratificational position that the model must be
patterned on the physical appearance of the system to endure, it must be true
that such a model will always present the most generalizations.

Clearly this will not necessarily be the case. The reality of the
data has two parts: apparent reality and essential reality. Apparent reality

is what the system looks like, its physical container. Essential reality is the underlying set of principles which science is interested in describing, principles that account for regular patterns and choices in the data. If these two realities coincide, then a model of the external system will completely explain the patterns in the data. But such a phenomenon is rare: a detailed cross-section, microscopic sketch of a plant cell is likely to be most unrevealing as to explanations about photosynthesis or evapotranspiration. Similarly, a drawing of the connectivity of pipes and wires in a car does less to explain why the engine works than would a few abstract formulas accounting for the energy relationships. One school of scientific philosophy is actually opposed to the use of physical models because they can detract from the logical search for laws by encouraging involvement in merely external details:

> Duhem admits that such models drawn from familiar mechanical gadgets may be useful psychological aids in suggesting theories. . . . But this admission implies nothing about the truth or significance of the models, for many things may be psychological aids to discovery. . . without implying that they are of any permanent significance in relation to scientific theory. Duhem's main objection to mechanical models is that they are incoherent and superficial and tend to distract the mind from the search for logical order. (Hesse, 1966:2-3)

In language, the apparent reality is present in the utterances of speakers. A model that merely presents the external system achieves no more than observational adequacy. Thus linguists attempt to devise representations of the set of principles accounting for appearances. But another approach is possible, for it is not debatable that a physical linguistic system exists in the brain. Instead of studying speech, linguists could study the nerve structure of the brain. Even so, they are faced with the two realities; and a model that incorporates only the outer reality of the

brain has still not achieved adequacy. An explanation of the brain's under-lying system is necessary; and it would be expected to correspond to the underlying principles necessary to explain language, since the physical linguistic system must be able to produce just those generalizations present in the manifested language. Of course it is obvious why this alternative approach is rarely taken: the physiologic linguistic system is quite inaccess-ible to most of us.

SG seems to assume that the apparent and essential realities of the brain coincide (based on their insistence that linguistic models must resemble physical aspects of the brain). Therefore any rules concerning network nota-tion systems in general will fully explain the linguistic system. This is making the strong claim that the purpose of a brain system - to produce language, for instance - has very little effect on neural organization. But this is not a privileged position, it must be tested and justified. Evidence must be produced that shows that the brain does indeed operate this way.

SG has not attempted to test the predictions made by its hypothesis about the brain. Instead it has proposed a theory to explain the essential reality of the brain, has used this theory to explain linguistic data, and finally has justified the linguistic explanation on the basis of the reality of this same theory. In short, SG assumes the conclusion and thus neither explains brain structure in terms of language nor language in terms of brain structure. Both remain unrevealed.

From another point of view, setting up notational precedents is extremely dangerous. In the normal case, the notation is one thing that we want to test. If it is not empirically accurate and fails to value generali-zations, it is discarded. But if it is maintained by some extra-theoretical

standard, it cannot be falsified by its failures; progress towards adequacy cannot occur. The invalid system will be retained despite its failings, and more valid systems will not be considered. Notational precedents decrease testability and thus can have no place in deciding the adequacy of a theory.

Several other considerations weaken the stratificational theory of the brain and language. First, very little is known about the operation of the brain; and SG incorporates only a portion of that. In this sense, its notion of cognitive reality is quite superficial. For example, information is 'stored in' the connectivity. Hence SG provides pathways which lead to an eventual result. But in one sense of 'stored in,' these connective lines, which are all alike, 'store' nothing at all. Also, given the superficial state of knowledge about the brain, there is no reason to rule out the possibility of considerations that parallel the notions of ordering and process formulation which appear in TG.

Stratificational linguists also claim that psychological tests of transformational postulates have not supported the theory. It is hard to imagine, though, what kind of psychological test could prove or disprove the underlying competence in language. Since it is unknown how this competence should be manifested through performance, any assumptions the test is based on are likely to be false. For example, a test of processing time as a measure of transformational complexity assumes a correlation between these factors. None of these psychological assumptions are themselves proven, so they can hardly be used as a basis for testing another theory. This is reminiscent of a recent attempt to prove or disprove, once and for all, the existence of ghosts in certain haunted castles. The researchers decided to take infrared photographs, assuming that white flashes on the film would

indicate the presence of a ghost. There were no white flashes and the investigators disclaimed the existence of such spirits. One wonders if this conclusive evidence disturbed the ghosts. Chomsky states:

> . . . there is sufficient evidence to suggest that all existing approaches to the study of human intelligence and human behavior are seriously defective. (1967:547)

There is some actual physical evidence, on the other hand, which seems to contradict stratificational claims. Stratificationalists maintain that the notion of language universals, as explored in TG, should not be incorporated in linguistic theory. Thus their notion of acquisition seems to be that the linguistic system is built up in layers, bit by bit, as the child is exposed to his language.

> Is it unreasonable to assume that the child learning his language builds up the underlying neural structure step by step in very small units? (Reich, 1968:100)

But scientists studying the physical nature of the brain and speech have noted that the acquisition of language follows a growth curve. When the child reaches a certain age, he begins talking, given some exposure to language. This seems to be more a function of physical maturation than imitative behavior, especially since the child's abilities soon seem to outstrip the language he is likely to learn by imitation.

> The progressive arborization described by Conel is thought to be purely maturational. I know of no empirical evidence that could support the notion that dendritic arborization in the cerebral cortex is the function of sensory input. (Lenneberg, 1966:409)

> There is increasing criticism of the traditional emphasis of learning theorists on mimicry, overt practice and external social reward as highly important factors in natural language learning. We are beginning to believe that these factors are not of great importance in the early stages of the production of language

> and that, in fact, it is possible for language to
> be learned quite well with a minimum of overt practice,
> reward, and so on.
>
> For instance, in the acquisition of grammatical
> patterns in two-year olds, I have evidence that spon-
> taneous mimicry is grammatically more primitive than
> the sentences the children make up by themselves.
> Grammatical development cannot be accounted for by
> the assumption that children simply imitate. There
> seems to be something more complicated going on that
> makes the reception system probably of far greater
> importance than we have hitherto believed.
> (Ervin in Lenneberg, 1966:59-60)

Similarly, Chomsky says:

> It can hardly be seriously proposed that abstract
> principles of phonological organization of the nature
> of those discussed here are learned by any inductive
> process . . . (1967:547)

If these physical considerations can be said to have any bearing on linguistic

theory at this time, they seem to be more alligned with TG than with SG, for

transformationalists assert the existence of an underlying natural human

language which is somehow altered to fit the patterns of individual language

by the addition of language specific rules.

In conclusion, the stratificational claims to greater physical

reality have no import. On the one hand, there is no reason to believe that

the notational system, or brain theory, of SG is particularly real. On the

other, there is no theoretical concept of better notational system apart

from its ability to capture generalizations.

The inappropriateness of process description. The stratificational

argument is that process is only appropriate for historical linguistics,

where real changes of one form into another do occur. But in synchronic

linguistics it is inappropriate because process imposes a false notion of

change and time upon what must be considered a static structure.

> But the device which Chomsky . . . proposed for
> dealing with these data, namely the now-famous trans-
> formational rule, was unacceptable to me since it was
> a process formulation, involving mutation of forms on
> the same level; and while such a formulation could
> apparently account for the primary data it was not
> realistic as applied to encoding and decoding.
> (Lamb, 1971:17)

First, it is no argument to reject process rules because they are
used in diachronic linguistics. Clearly this does not necessarily make
them inappropriate for synchronic studies.

Second, SG is again arguing as though there were some notational
precedent:

> Other linguists found these process formulations so
> useful, since they could summarize in one statement the
> alternation of indefinitely many allomorphs that they
> went ahead and used them and said, in effect, 'let
> cognitive reality be hanged; I want economy!' (1971:17-18)

But there is no theoretical notion of better system apart from economy and
generalizations.

Another argument is similar but more specific. Stratificational
theorists claim that the processes suggested by mutation rules - deletion,
rearrangement, and alteration of forms are impossible.

> Speaking only somewhat loosely, one may say that
> the best one can do using a mutation framework is to
> talk about manifestation of linguistic structure rather
> than about linguistic structure itself. The process
> description tends to derive manifestations of linguistic
> structure from other manifestations of linguistic
> structure, while the stratificational description shows
> how manifestations of linguistic structure are derived
> from linguistic structure. (Lamb, 1972:671)

This follows from the recognition that competence must be represented
by static structure in the brain. Static structure cannot be imagined to
disappear, reappear, and run around inside the head performing transforma-
tions. The only processes are those involved in production, where the

movement of the signal from point to point might be appropriately described in terms of change.

If transformationalists were making such claims, they would truly be in violation of reality. But viewing a theory as a metaphor, notational devices are simply abstract representations of certain considerations that must be present in the physical system to account for its ability to manifest the generalizations present in the data. Clearly alternation is significant whether called realization or transformation, whether represented in terms of formulas or networks. How alternation is correlated with the physical brain system will only be understood after detailed investigations of the brain itself.

Finally, stratificationalists claim that certain concerns cannot be expressed in process notation:

> Such a mechanism [as process] cannot be used for a communicational description, because the structure-altering rules are intrinsically one-way rules. . . (Sampson, 1970:12)

Transformational grammar does not claim, however, that the arrow in process descriptions corresponds to a direction of production. Rather the entire system of rules represents the underlying competence of the individual. It is neutral as regards encoding or decoding, input or output performance (Chomsky, 1965:9). In whatever way encoding and decoding physically operate, both processes must certainly have access to the kinds of linguistic information described in TG, or language would never be manifested as it is.

In this case, SG sets itself more ambitious goals than TG, for it expects to account not only for the underlying competence but for the method of activation. But this production method will most likely be determined to a great extent by physical considerations in the brain, and hence is

accessible only through study of the brain itself. When knowledge about the brain reaches the point where the physical counterparts of linguistic competence are identified, perhaps then we can make some interesting statements about encoding and decoding. But claims about the physical activation of competence made on the basis of linguistic investigations are all more or less uninteresting, since they cannot be justified or falsified by the evaluation measures of linguistic theories or by any knowledge we presently have.

The inappropriateness of underlying concrete representation. The argument against process merges into the stratificational claim that no concrete entities should appear in the underlying system. Though SG labels nodes or lines of its graphs for convenience, these labels only refer to the eventual realization. The nodes and lines themselves have no essential content. Thus SG can never say an item is 'derived from' another item. Figure 3a represents the stratificational formulation: the underlying entity is arbitrarily related to both of its realizations.

The process approach in TG considers the underlying entity to be more or less concrete, with some linguistic content that determines its realization. In a typical alternation (Figure 3b), one of the alternants is chosen as the underlying form. In other cases, a third entity, phonetically more or less similar to the outputs, might be chosen. In either case, the underlying representation is considered to have content.

SG rejects this possibility as pushing the elements of output into the underlying competence:

> Generative linguistics. . . has been concerned with
> abstract systems, but the nature of these systems has
> been such that it remains dependent on substantive

(a)
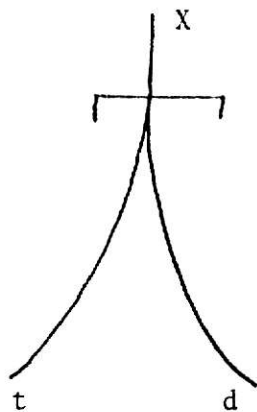
(b)

FIGURE 3

> items, which have had to be projected to the deepest layers
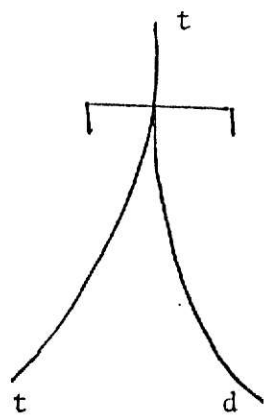> of its structure. . . . In a stratificational grammar,
> however, no items are needed within the linguistic system,
> which may be conceived as a series of purely relational
> connections between conceptual and phonic correlations.
> (Lockwood, 1972a:13)

The two notational hypotheses make different predictions about language; hence the argument can only be settled by an empirical test rather than the appeals to conviction made in the quote above. TG predicts that two phonemes which partially neutralize in one historic period could separate out and return to their original distributions. SG cannot value this prediction. Since there is nothing concrete in the underlying stratificational system, there is no way that physical features could become submerged and reappear. The relation of sound patterns and changes across eras should be purely arbitrary. There is data to support the transformational prediction, which is presented by Kiparsky in "How Abstract is Phonology" (1968:5-6).

Kiparsky's Russian examples are represented in Figure 4. The dentals and velars undergo palatalization and spirantization rules that result in the falling together of /d/ and /g/ in certain environments. First, the palatalization rule converts them to the affricate /ǰ/, and the spirantization rule realizes both as the corresponding spirant /ž/. But the Ukrainian and Belorussian forms of this system have reacted differently historically. The segments /d/ and /ɣ/ (a reflex of /g/ in these languages) were originally converted by palatalization into /ǰ/ and /ž/, respectively. That is, the palatalization rule did not bring about neutralization. The spirantization rule operated on the line of derivation from /d/ alone, realizing /ǰ/ as /ž/ and completing the neutralization. In later history, these two neutralized forms separated, so that all and only those /ž/ derived from underlying /d/ became /ǰ/. This can easily be explained by postulating

	Russian				Ukrainian, Belorussion						
(a)	/ž/	/d/	/g/	(1)	/ž/	/d/	/ɣ/	(2)	/ž/	/d/	/ɣ/
Palatalization	.	/ǰ/	/ǰ/		.	/j̃/	/ž/		.	/ɣ̆/	/ž/
Spirantization	.	/ž/	/ž/		.	/ž/	.		.	/ž/	.

Neutralization and Separation of Noncontinuant and Continuant

1st Period   /d/   /ɣ/

/ž/

2nd Period   /ǰ/   /ž/

(b) Description Using Abstract Representations

1st Period   2nd Period

FIGURE 4

that the spirantization rule was removed.

Now, if there were no underlying forms that dictated the nature of the output forms, the neutralization of /d/ and /ǰ/ would be complete in the palatalizing environments. No connection between the phonetic qualities of /d/ and the distribution of certain /ž/s could be maintained. Figure 4b indicates the approach a system with totally abstract underlying forms must take. Clearly, at the time of separation there is no information in the system to govern which /ž/s should repattern as /ǰ/s. The highly regular reorganization of just those forms derived from a certain underlying phonetic bundle, /d/, must be treated as arbitrary; and it is unexplained why out of all the possible changes that the segments could have made if truly in a random system, only those, and all of those, that pattern according to historical antecedents should have been chosen.

Another consideration supporting the hypothesis of concrete underlying representations is that alternations between phonetically similar elements are expected. Likewise, alternations between completely unlike elements are unusual. For example, an alternation between /t/ and /d/ would be commonplace; but a linguist would be quite surprised to find an alternation between /a/ and /s/. This can be explained in the process system, for every form normally differs from its underlying representation by just a few features. Thus alternants will be very similar since they must share a common phonetic base. SG must insist that alternations are arbitrarily grouped, and hence cannot explain why phonetically similar pairings are more common.

The stratificational principle of totally abstract underlying representations fails to account for empirical events and is thus very suspect,

in spite of claims that it is 'appropriate.'

Strata and the Phonemic Level

Stratificational grammar sets up a set of definite levels, at least
one of which finds no counterpart in TG: the phonemic level. But the strati-
ficationalists believe that it is not only possible but necessary to have
such a stratum. Since each stratum represents a class of features with its
own properties of arrangement, to leave out a level is to miss a generaliza-
tion.

Daneš defines a stratum as follows:

> To summarize, the stratum of the language system may
> be conceived of (extensionally) as the class of units
> showing the same degree of complexity and having, simul-
> taneously, the same constructional function. (1971:129)

And Lamb concurs:

> A stratum differs from its neighbors with regard to
> its elements and their combinations. The elements of a
> stratum, i.e. the upward ANDS of its knot [diamond] pattern,
> are obviously unique to that stratum. (Lamb, 1966c:21)

Alternations in the data are heavily relied on as evidence of strata.
As we have seen in the discussion of process notation above, alternations
between stratificational units cannot occur on the same level. Thus where-
ever any alternation occurs, this theory must establish higher and lower
levels. Daneš recognizes the problem this restriction creates whenever only
a few forms alternate. He reflects that this represents the inexactness of
strata in classifying language operations (1971:133), and proposes the further
constraint that no stratum can occur unless the alternations it accounts for
affect the majority of forms in the language:

> It is evident that this result is in contradiction
> to our concept of stratum and that this contradiction can
> be removed simply by the acceptance of our requirement

that no stratum proper Sn+1 may be established, unless
all (or an overwhelming majority of) units of the stratum
Sn+2 be constructed of the units of the stratum Sn+1. If
this requirement is not met, the units of the assumed
Sn+1 may be treated as interstratal units only. . .
(Daneš, 1971:134)

The solution, which amounts to allowing some forms to have a longer
derivational history than others, approaches process description, which is
abhorred by stratificationalists. But Daneš claims that it is necessary to
allow units on one stratum to be constructed of other units on the same
stratum: "so that the component units are recurring once more as means of
construction of a unit on their own stratum'." (1971:135).

It is inconceivable how SG can incorporate such a solution, consider-
ing that its underlying forms are abstract and unanalyzable. There is no
concrete item or content from which another form could be derived; there is
nothing that can predict the form of an output item and guarantee its rela-
tionship to the input item.

The need to posit strata wherever alternations occur poses other
problems. Connective lines between strata represent the 'rules' of alter-
nation. But nonalternating forms must also be realized on each stratum, and
hence will be treated like alternating items and be represented by a useless
set of 'rules.' For example, 'man' must be represented by a terminal on the
morphophonemic, phonemic and phonetic levels, yet undergoes no phonemic
alternation (Postal, 1968:201). It cannot be realized directly from morpho-
phonemics, since at this point it has no content. Thus if a form by-passes
a stratum, it will not receive an 'ideal' phonetic representation - it will
simply receive no representation at all. Nevertheless, while recognizing
the redundancies this produces (Lamb, 1964:116) stratificationalists feel
the loss is worthwhile compared to the gain of having strata.

The phonemic controversy. The main stratal debate centers around
the phonemic level. Stratificationalists maintain that this level must be
distinct because it is represented by unique patterns of arrangement; hence
it represents a significant generalization.

> Phonological units occur in definite patterns of
> arrangement which are independent of the grammatical
> patterns and meanings of the morphemes which they
> represent. That is, there is in every language a set
> of relationships concerned with the composition of
> syllables and other combinations of phonological
> units. (Lamb, 1966d:607)

Moreover, the stratificational simplicity measure is so designed
that it gives higher value to a system with a phonemic level. Figure 5
shows clearly that the addition of a phonemic level greatly reduces the
number of connections required in each stratum and thus simplifies the
grammar. Since simplicity is supposed to coincide with real generalizations,
a demonstration of the nonexistence of this level would show that SG was
quite wrongly conceived. Needless to say, this gives stratificationalists
quite a motivation for maintaining a phonemic stratum. In addition, the
distinction between phonemic and phonetic level represents the difference
between contrastive forms and those phonetic variances which are determined
by context.

> The outstanding characteristic of C-phonemics is its
> insistence that there is such a thing as a phonemic level.
> That is, it holds that some features of speech sound, or
> of articulation, are distinctive while others are not.
> The former are phonemic, the latter subphonemic. Another
> version of the principle is that contrastive phonetic
> differences must be distinguished from those differences
> which are noncontrastive. (Lamb, 1966d:608)

TG does not argue the importance of indicating the distinction between
contrastive and non-distinctive forms, for this certainly is part of a
speaker's knowledge about his language. But there is nothing in theory that

(a)

tin (k)nit nat tan ant

ns Ap Fr Vo Lo hl cl

(b)

tin (k)nit nat tan ant

t n l a
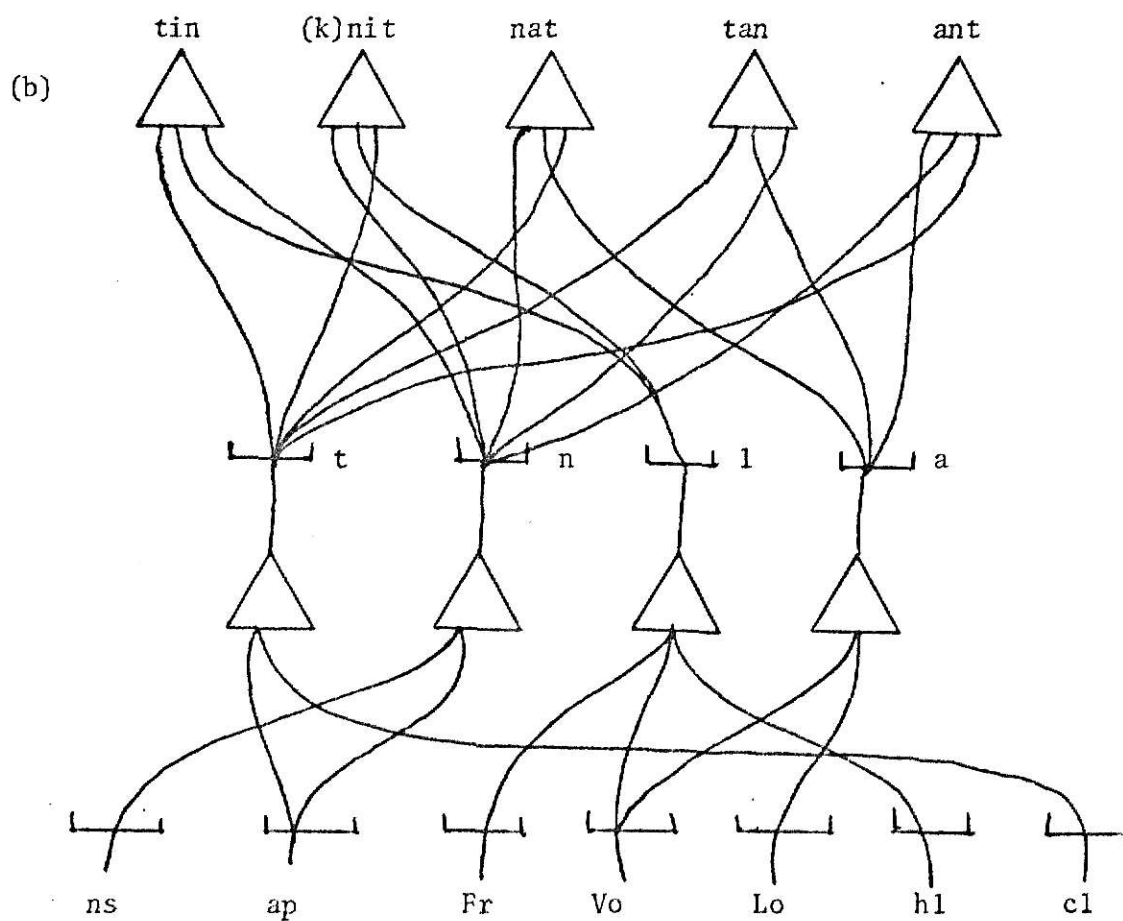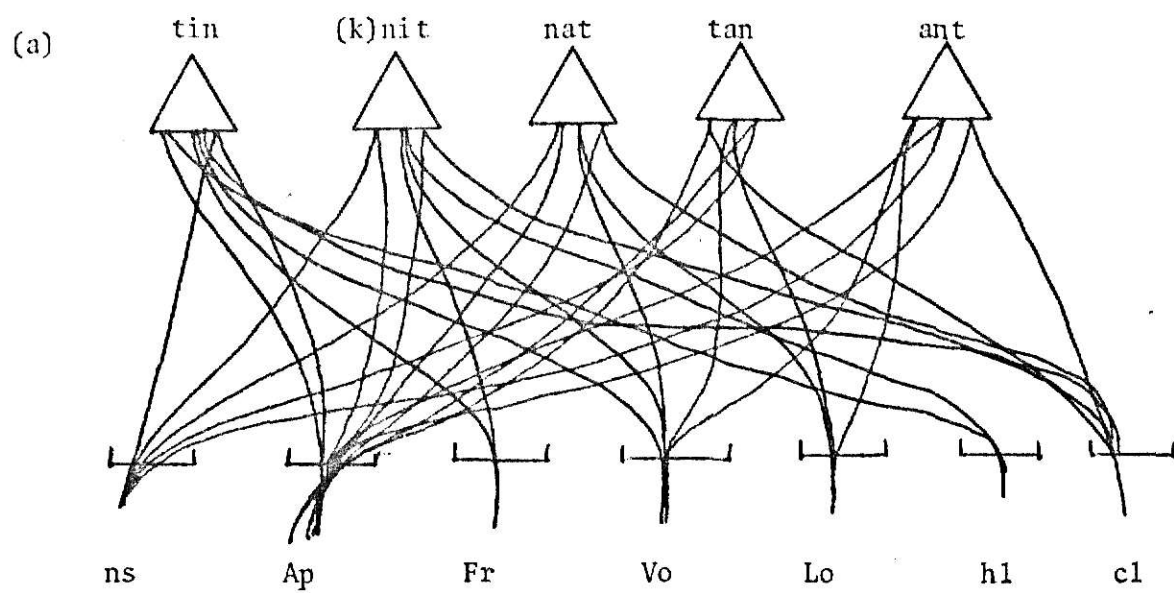
ns ap Fr Vo Lo hl cl

FIGURE 5

indicates differences must be represented by a unique level of structure (Postal, 1968:15). Thus transformationalists claim that even without a distinct phonemic level, they are able to explain the notion of distinctiveness:

> Two distinct phonetic representations are in the same free variation set and hence descriptive of noncontrastive utterances just in case they are assigned by the rules of the phonology to the same single input systematic phonological representation and not otherwise. (Postal, 1968:14)

Thus contrast and neutralization are determined by phonological history; the speaker's knowledge of distinctiveness represents his knowledge of the way his phonological rules operate on phonetic features.

> Nondistinct (identical) phonetic representations are, of course, always in the same free variation set regardless of which systematic structures they are assigned to. . . . Every other pair of phonetic representations is contrastive because no two of them are assigned by rules of this language to the same input systematic structure. (Postal, 1968:14)

Not only do transformationalists find the phonemic level unnecessary, but Halle has demonstrated that generalizations must be lost if such a level is posited. Figure 6 represents Halle's Russian data (Postal, 1968:39-41 and Lamb, 1966d:612). The significant point is the voicing of voiceless obstruents /t/ and /č̌/. If only columns 6a and 6b are considered, this alternation can be simply stated as in 6d: obstruents become voiced in the environment before voiced obstruents. But phonemically, /t/ and /d/ in Russian contrast, while /č̌/ and /ǰ/ do not. To meet the classical phonemic (C-phonemic) requirement that a level indicating only contrastive and no determined features be included, column 6c must be added. The non-phonemic /ǰ/ cannot be represented here.

This maneuver results in neutralizing /t/ and /d/ before the phonemic level, while the alternation in the affricates comes after the phonemic

6a

d'at,   bi

d'at,   bi

ž'eč,   l,i

ž'eč,   bi

Systematic Phonemic

6b

d'at,   l,i

d'ad,   bi

ž'eč,   l,i

ž'eǰ,   bi

Systematic Phonetic

6c

d'at,   l,i

d'ad,   bi

ž'eč   l,i

ž'eč   bi

Autonomous Phonemic

6d $[+\text{obs}] \longrightarrow [+\text{voice}]/\underline{\hspace{1cm}} \begin{bmatrix} +\text{obs} \\ +\text{voice} \end{bmatrix}$

6e   (1)   all obs except $\longrightarrow [+\text{voice}]/\underline{\hspace{1cm}} \begin{bmatrix} +\text{obs} \\ +\text{voice} \end{bmatrix}$

                        c,č,x

     (2) $[c,č,x] \longrightarrow [+\text{voice}]/\underline{\hspace{1cm}} \begin{bmatrix} +\text{obs} \\ +\text{voice} \end{bmatrix}$

FIGURE 6

level. The single process that accounts for all the alternation must be stated twice, as in 6e.

This situation is represented graphically in Figure 7. Neutralization between contrasting 'a' and 'A' occurs in 7a. To allow the phonemically contrasting forms to each have a unique realization, the neutralization is effected on a higher level, even though it represents the same process as in d and f. On the other hand, a series such as in 7c is forced to repeat unchanging forms simply to ensure a phonemic level. Transformationalists consider this evidence that no real phonemic level exists: the process of derivation of forms must be artificially halted at an imaginary mid-point between systematic phonemics (morphophonemics) and phonetics, requiring that rules be split or new rules added to force a stratum to appear.

Stratificational linguists do not reject Halle's demonstration but feel that an alternate C-phonemic analysis will permit a maximally contrastive level that loses no generalizations. They point out that the purpose of any 'emic' level is to set up only the distinctive elements for that level:

> Naturally, just as the C-phonemicist does not set up structural elements on the 'emic' level for the nondistinctive differences, so also he should refrain from setting up elements to account for the features of the medium. (Lamb, 1966d:613)

Voicing is to be considered a part of the 'medium', a normal accompaniment of speech unless otherwise stated. To this end, a devoicing phoneme /h/ is proposed which when in combination with any phoneme produces its voiceless counterpart. It follows that the expression of voiced and non-voiced segments on the phonemic level in the C-phonemic Russian analysis is a simple failure to apply the notion of distinctiveness.
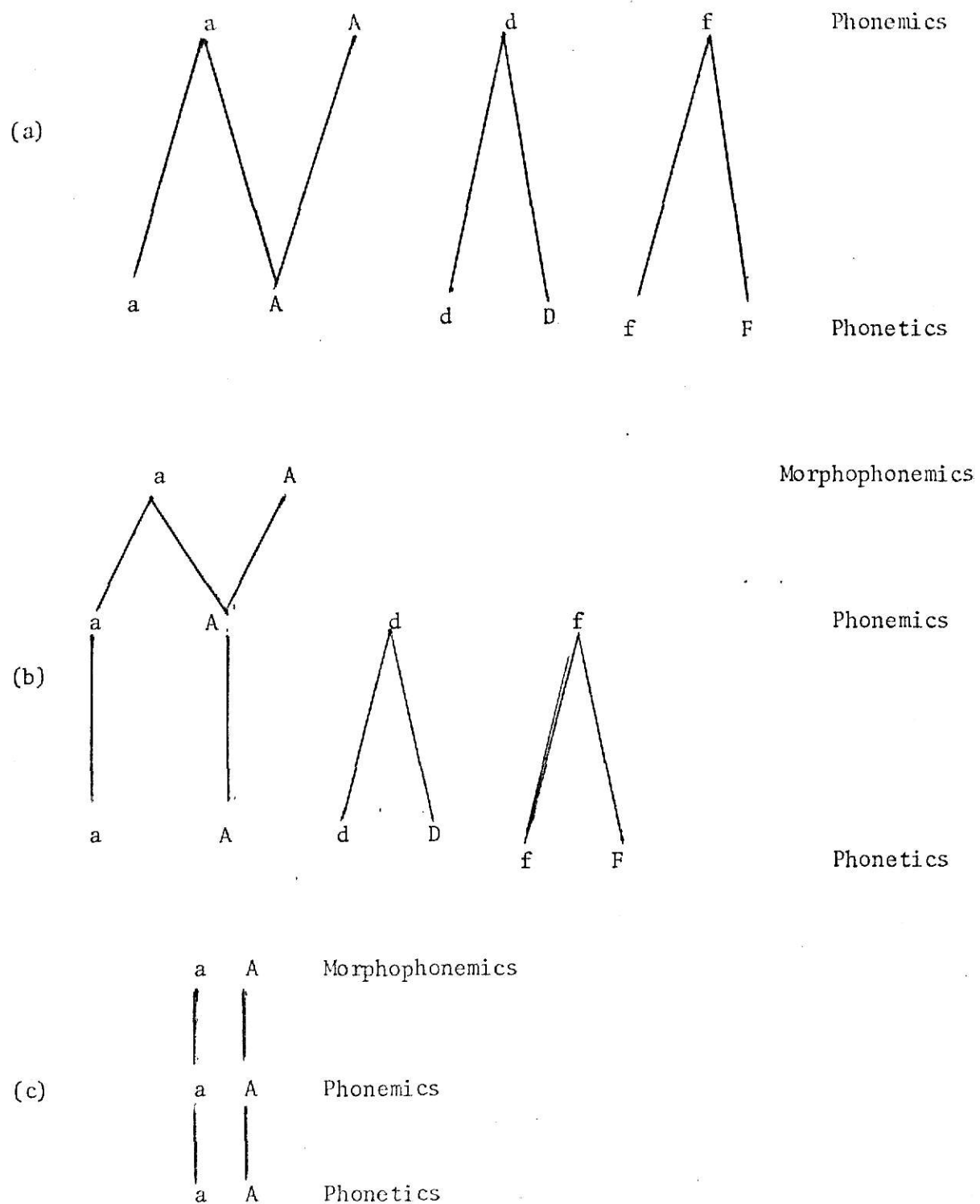
FIGURE 7

> That is, it is uneconomical from the standpoint
> of C-phonemics. It is assigning phonemic status to
> phonetic features which in fact are not distinctive.
> (Lamb, 1966d:612)

The result is that Halle's phonemic analysis is rewritten as in

Figure 8. Each of the segments in question is paired with the devoicing

phoneme. To produce the voiced alternants, only a single rule is required,

that the devoicing phoneme /h/ drops before voiced obstruents, as in 8d.

With this analysis, autonomous phonemics is able to present a distinct phonemic

level that requires no more rules than the non-stratal analysis.

Two conflicting analyses present themselves: the notation of TG

prohibits a phonemic level, while the notation of SG requires it. In one

of these two theories, the simplicity count as a supposed measure of

generalizations gives maximal value to a less-valued solution. Thus this

debate takes on import far beyond the question of phonemes; it is a symptom

that one system is basically unsound. Lamb voices this consideration when

he attacks TG:

> . . . for Chomsky (1969) and Halle (1959) find that
> level [C-phonemic] not only useless but also bother-
> some. . . . This view of multiple levels none of which
> is the classical phonemic is not a reflection of the
> nature of linguistic structure but is rather a conse-
> quence of applying to that structure a method of descrip-
> tion inappropriate to it. (1966c:36)

A close view of the stratificational analysis, however, shows that

it does not save the phonemic level. According to Lamb, one of the main

justifications of the phonemic level is to provide a specification of just

those phonemes which contrast.

> The principle of differentiating the distinctive from
> the nondistinctive by means of phonemic as opposed to
> phonetic transcription means that although the phonetic
> transcription should show all the detail that is practically
> feasible, the phonemic transcription should show all those

(a)	(b)	(c)
m'ogh 1,i	m'ogh 1,i	m'ok bi
m'ogh bi	m'og bi	m'og bi
d'adh 1,i	d'adh 1,i	d'at bi
d'adh bi	d'ad bi	d'ad bi
z̆'ejh 1,i	z̆'ejh 1,i	z̆'ec 1,i
z̆'ejh bi	z̆'ej bi	z̆'ej bi

| Morphophonemic | Phonemic | Phonetic |

(d)   /h/ ⟶ ∅ ____ $\begin{bmatrix} +\text{voice} \\ +\text{obs} \end{bmatrix}$

FIGURE 8

> features which are distinctive, and no others. . . .
> More precisely, the distinctiveness principle is that
> a correct C-phonemic solution treats two units. . . as
> phonemically different if and only if there is a distinc-
> tive phonetic difference between them. (Lamb, 1966d:611)

The stratificational phonemic analysis violates these principles. As can be seen in Figure 9,[1] non-contrastive /ǰ/ must be treated as phonemic, even though it is completely predictable. At the same time, the completely contrastive voiceless counterparts of /d/ and /g/ are treated as though they were noncontrastive. Thus in this diagram, the notion of distinctiveness is lost.

It might be insisted that the morphemic and morphophonemic levels will determine the phonemic combination to allow just those phonemes required. Figure 10 presents a sketch of this derivation. The items on the morphemic and morphophonemic levels are left unlabelled to emphasize their abstract nature. In this analysis, a voiceless phoneme is designated by the unordered 'and' between the morphophonemic and phonemic levels. The 'and' specifies that the morpheme in question must be realized with the devoicing phoneme which will eventually produce the voiceless variant. The tactics can cause zero realization of the devoicing phoneme /h/ between the phonemic and lower levels, providing for the contextually voiced phonemes.

In Figure 10, /g/ and /d/ can be realized in two ways: one produces the phonemic voiced form, and the other path must combine /d/ and /g/ with the devoicing phoneme. But /ǰ/, which does not realize phonemically in its voiced form, must always be combined with the devoicing phoneme. Nevertheless the phonemic level must still characterize voiced, noncontrastive /ǰ/ as the basic terminal. This does not predict what actually occurs: that voiced /ǰ/ is never contrastive. In each case, the voiceless phoneme is characterized
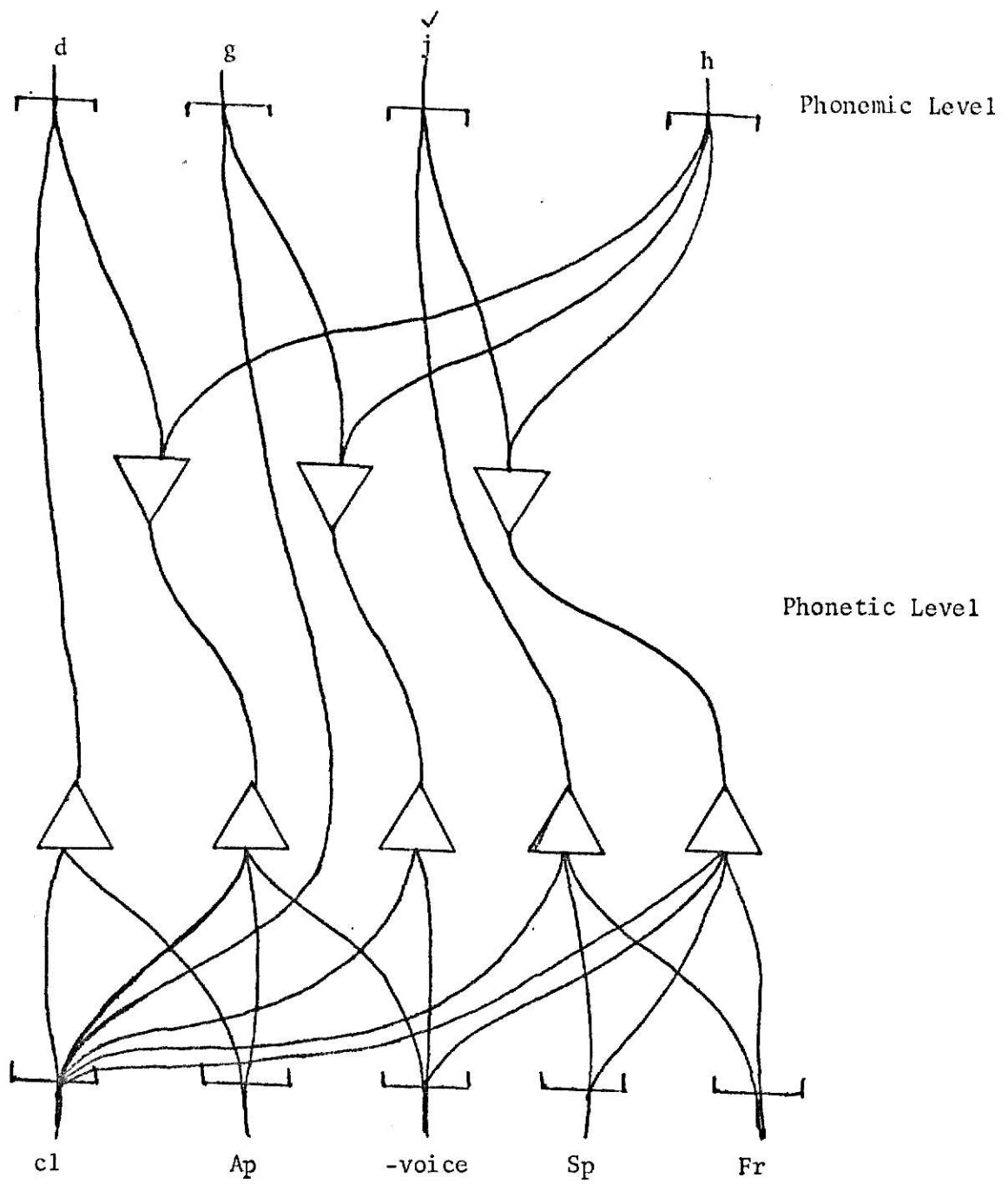
FIGURE 9

as a purely arbitrary combination phenomenon; its phonemic status is completely accidental when compared to the voiced counterpart. Once again the notion of distinctiveness is perverted.

The stratificational counter-analysis is also inconsistent. If we are going to analyze out the contrast-forming feature voicing, we should likewise analyze out other contrast-forming features. Thus nasals are distinguished from all other forms by the feature +nasal, and /m/ differs from /n/ and /p/ from /t/ in the feature +labial. Soon there would be nothing but discrete phonetic primes. The result is not a phonemic level, but a distinctive feature level. But as we have already seen in Figure 5, the simplicity measure requires some level intermediate between features and morphemes - some level that corresponds to bundles of features. Thus a new phonemic level must be reinstated, between morphemes and distinctive features.

This situation is similar to Figure 11. Now there is no direct relationship between the phonemic and phonetic levels; hence purely phonetic alternation cannot be stated in terms of its phonemic environment. The distinctive features can be attached to alternant phonetic realizations, but this would indicate that every phoneme with that distinctive feature underwent the determined alternation. To specify assimilation in just one set of segments, the entire conditioning environment of the phonemic level would have to be reconstructed in the phonetic tactics.

In yet another way the stratificational phonemic analysis fails. The labelling of lines and nodes with symbols like /h/ for the devoicing phoneme obscures the fact that these terminals have no content. There are no voiced or voiceless segments at this level; no analyzable component such as voicing
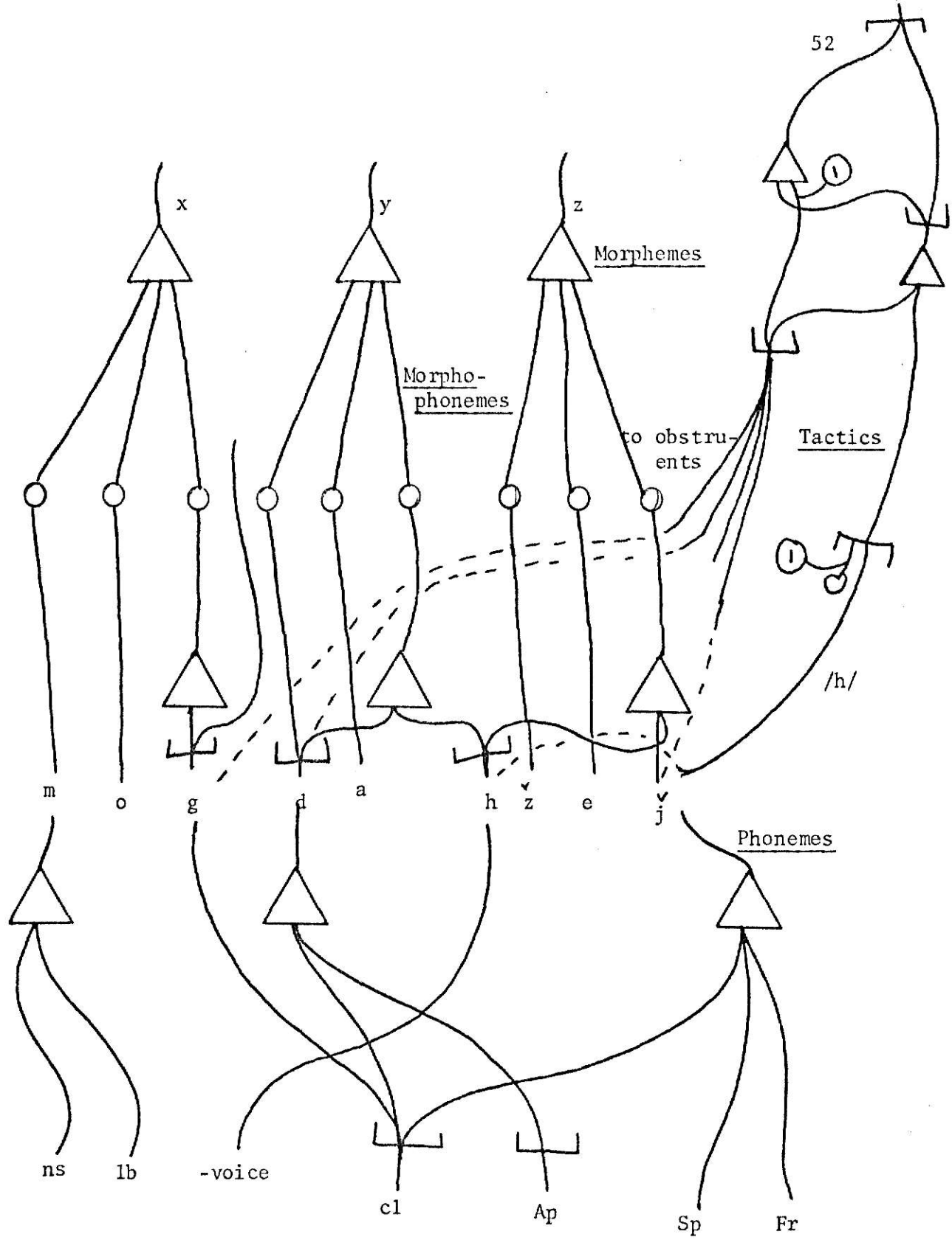
FIGURE 10

exists to be sifted out. It must be remembered that all the underlying nodes are essentially homogeneous in content. Thus we cannot set up nodes to guarantee a distinctive relationship in other nodes, such as the devoicing /h/. None of these terminals, including /h/, have any predictable relationship with their outputs. The only way to indicate distinct (or at least separate) entities at the phonemic level is to represent each by a distinct diamond node.

There still exists, however, the contention that the phonemic level includes independent syllable construction restrictions. Systematic phonemicists claim that no tactics exist which are specific to the phonemic level:

> Yet every fact which such a separate phonotactics
> describes is accounted for without the autonomous level
> by the morpheme internal restrictions on morphophoneme
> combinations and the morphophonemic rules which must
> exist in any event. (Postal, 1968:214)

This can be illustrated in a general way by the Russian analysis given previously. The changes that do occur after the systematic phonemic level are not even expressible with a phonemic level. All other features and arrangements are the same in the phonemic level as in the systematic phonemic level. The phonemics provides no new information.

Thus the stratificational attempt to save the phonemic level is unacceptable. It is an inconsistent and ad hoc analysis to cover the fact that SG is unable to postulate the optimal less-stratified analysis, is unable to match simplicity and generalizations, and is thus basically misformulated.

The inadequacy of strata as a basic generalization. To insure that rules which proclaim to express generalizations really fulfill this function, a theory must have some system of guaranteeing that similar items and

regularities are grouped together. This can be called the basic generalization. SG seems to have accepted strata as its basic generalization; but strata are not in themselves sufficient to guide a theoretical system to an optimal grammar.

Strata as a level of items with a distinct tactics can be proposed for almost any step in the language. Wherever there exists a set of units of the same 'size,' a separate tactics can be proposed that guarantees the arrangement inherent in the units. There is no reason not to hypothesize a level of clauses; all these have a certain similarity of complexity, and the tactics will be just those rules which prescribe the arrangement of clauses. Again, there is no reason not to hypothesize a level of phrases, which because they have some order will have a tactics to guarantee that order. And on it continues, for there is nothing in the notational system itself - nothing but the manipulation of the linguist - that says that levels that can be collapsed must not be separated.

What is required is a simplicity measure that values first the grouping of minimal similar units. Then, strata themselves could only apply where a break in levels was really warranted. As SG is formulated, the application of strata actually produces a simpler system. Thus there can be no notion of a higher-valued less-stratified system. Even worse, since there is no internal content, there is also no way of guaranteeing that a level actually consists of elements of the same type. Hence the devoicing phoneme /h/, which represents a feature, can be postulated on a level that is supposed to represent items of the complexity of segments: bundles of features. Certainly a stratificationalist would never postulate a level consisting of phonemes and clauses, or features and lexemes; but there is

nothing in the system itself that forbids such ridiculous solutions; it is the purpose of a notation to make such necessary decisons explicit and nonarbitrary.

Clearly the notion of strata as the chief generalization around which a theory is built is too vague and undetermined to guarantee significant generalizations.

Ordering and Artificial Notation

The fourth major attack against TG by SG is that its use of ordering is artificial. As a result, most of the claims of TG are products of notational artifice.

Stratificationalists argue that there is real ordering and false ordering, which are confused in TG (Lamb, 1972:672-676). Real ordering corresponds to stratal height in SG. Relative height of nodes in the tactics also represents real ordering, which is similar to the intrinsic ordering in phrase-structure rules in TG. Finally, the 'ordered or' represents real ordering, which is somewhat similar to the conjunctive-disjunctive ordering in TG. Any other ordering is a notational contrivance, and represents a failure to distinguish competence from performance:

> From these considerations we see that one of the
> reasons for the excessive ordering of rules found in
> mutational descriptions is the failure of that frame-
> work to separate the linguistic information from the
> operations for using that information. The result is
> that when a particular sequence of operations is required,
> this same sequence must be built into the information
> structure, in this case as ordering of rules.
> (Lamb, 1972:676)

The notational devices recognized by SG are not themselves part of the data, but represent theory-dependent conclusions about the data. The accusation that TG uses other kinds of ordering is simply a recognition that

the two theories are different. The only justification for ordering is that
it allows generalizations to be expressed that would otherwise be missed;
and the only reasonable attack that can be made is to show that TG's ordering
does not fulfill this function.

Stratificationalists attempt to show that transformational ordering
is such that it must produce simplicity whether or not there are generali-
zations. This claims, in fact, that ordering in TG functions similarly to
strata in SG. Part of this assault is against the validity of using
collapsing conventions.

> Although this use of collapsing conventions involving
> parentheses and brackets reduces the number of algebraic
> formulas and symbols needed to represent the same effec-
> tive information, it is the contention of the theory that
> these differences are devoid of linguistic significance,
> because they are not matched by any corresponding simplifi-
> cations of the graph. Such differences applying only to
> algebraic representation with no effect on the number and
> complexity of nodes in a graph are matters of superficial
> information. (Lockwood, 1972a:62)

Figure 12 presents the stratificational formulation of collapsing.
Both the collapsed rule and the string of rules correspond to the same
graph; thus if a rule involving collapsing is allowed to have a simpler
count, it will represent artificial simplification: no corresponding
generalization exists.

But this is not at all the kind of collapsing that can occur in TG.
Figure 13 presents a typical transformational case. The presence of phonetic
features allows an immediate evaluation of similarity or dissimilarity in
the rules. In 13a there is no such similarity, and a grammar that could
collapse these two rules would be quite wrong. But the rules in 13b are
very similar phonetically. The statement of their phonetic content guides
the collapsing to produce a rule, 13c, which is simpler, just to the extent
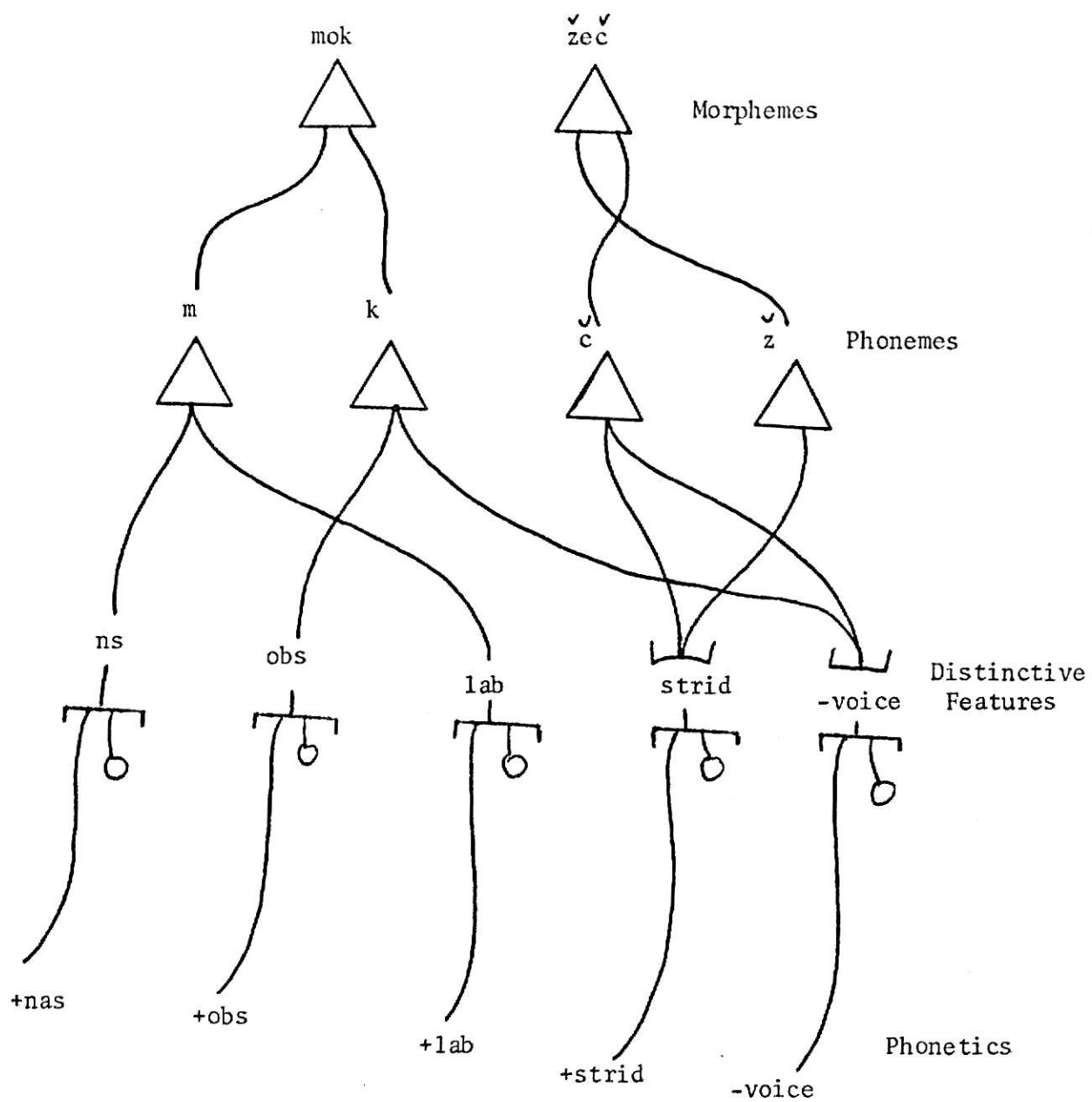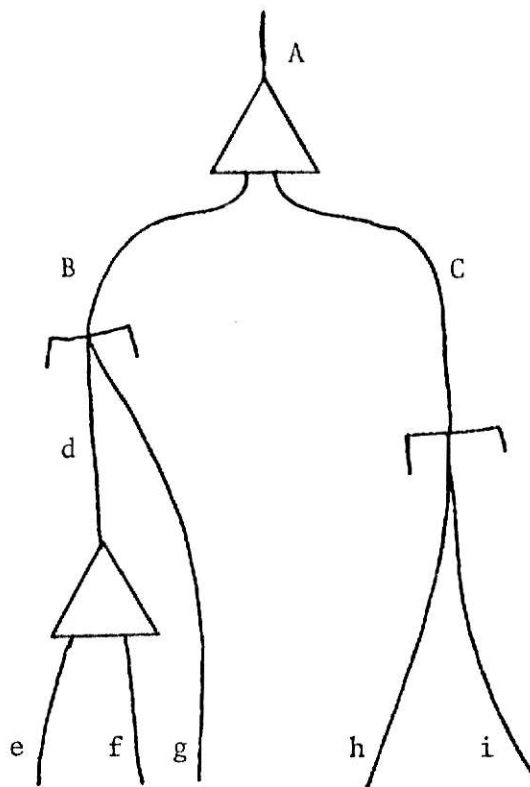
FIGURE 11

Graph

A/B C

B/d,g

C/h,i

d/e f

Expanded Rules for Graph

A/(e f),g h,i

Collapsed Rule for Graph

FIGURE 12

(a)

e

$$\begin{bmatrix} +voc \\ -cons \\ -high \\ \\ -back \end{bmatrix} \longrightarrow [+high] \bigg/ \underline{\hspace{1cm}} \begin{bmatrix} -voc \\ -cons \\ +high \\ \\ -back \end{bmatrix}$$

y

ø

$$\begin{bmatrix} +cons \\ -voc \\ -high \\ -back \\ -ant \\ +cor \\ +cont \\ -nas \end{bmatrix} \longrightarrow [+strident] \bigg/ \underline{\hspace{1cm}} \begin{vmatrix} +cons \\ -voc \\ +strident \end{vmatrix}$$

(b)

$$\begin{bmatrix} +voc \\ -cons \\ +low \\ -back \end{bmatrix} \longrightarrow [+high] \bigg/ \underline{\hspace{1cm}} \begin{bmatrix} -voc \\ +cons \\ +high \\ -back \end{bmatrix}$$

i

a

$$\begin{bmatrix} +voc \\ -cons \\ +low \\ +back \end{bmatrix} \longrightarrow [+high] \bigg/ \underline{\hspace{1cm}} \begin{bmatrix} -voc \\ +cons \\ +high \\ +back \end{bmatrix}$$

u

$\begin{bmatrix} a \\ æ \end{bmatrix}$

$\begin{bmatrix} i \\ u \end{bmatrix}$

(c)

$$\begin{bmatrix} +voc \\ -cons \\ +low \\ back \end{bmatrix} \longrightarrow [+high] \bigg/ \underline{\hspace{1cm}} \begin{bmatrix} -voc \\ +cons \\ +high \\ back \end{bmatrix}$$
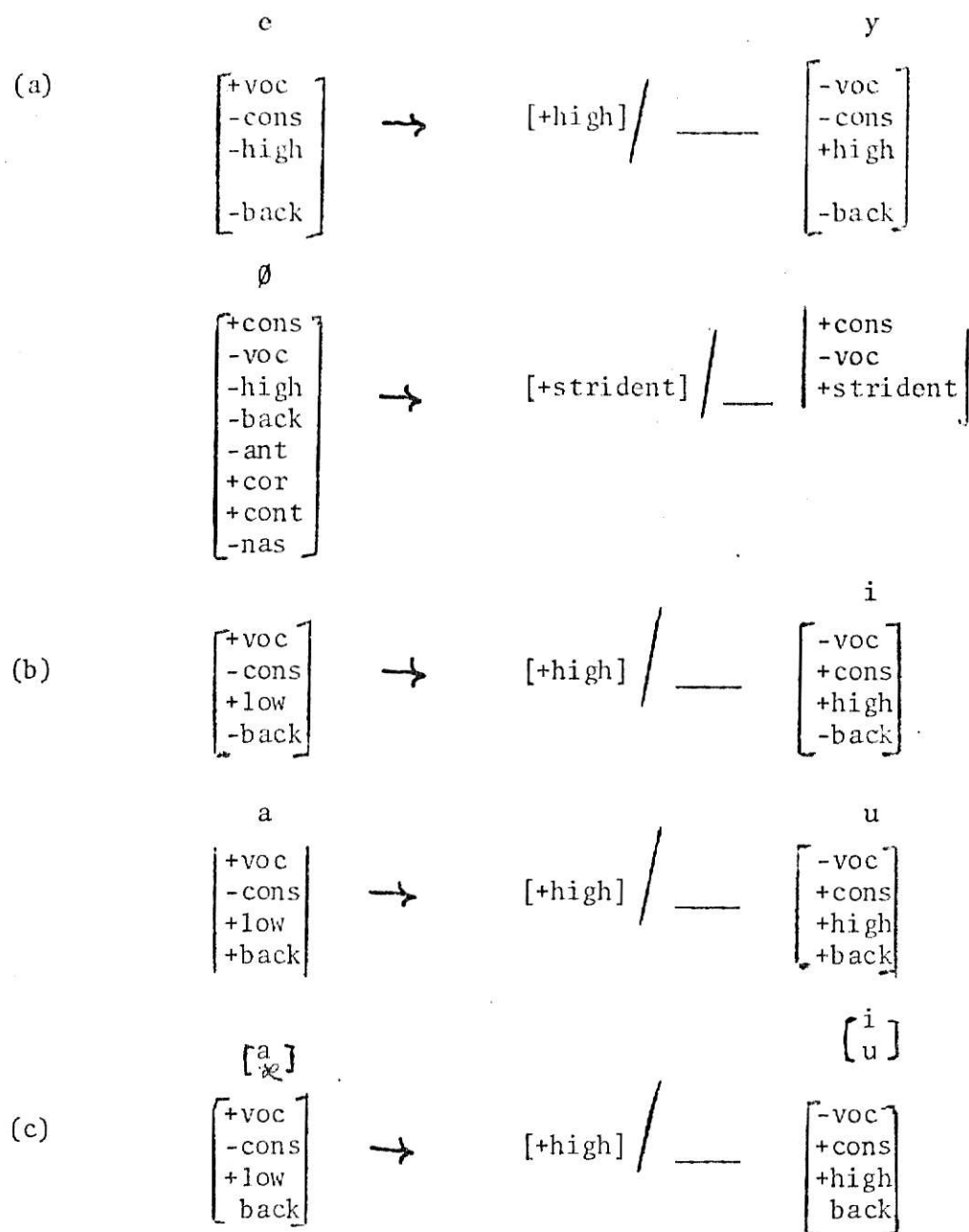
FIGURE 13

that the environments in 13b are phonetically similar. The stratificational
situation in Figure 12 would not arise, for TG could not produce the collapsed
rule unless the entities represented by A,B etc. were similar in some way.

Transformational ordering is similarly constrained. If a system of
unordered rules have partially similar environments, the environments will
still have to be expressed in each case. This is a significant loss of
generalization. But if the rules are ordered, the fact that the environments
are shared can be used to simplify the system. The rules in 14a have nothing
in common, while the rules in 14b share partial environments.[2] In an unor-
dered system, no distinction is made between the set expressing a generali-
zation and the set without a generalization. But if ordering is allowed to
apply, the rules in 14b can be expressed more simply, as in 14c. It is
important to recognize that the dissimilar rules in 14a cannot be simplified
this way in TG because there is no phonetic similarity that can be shared.
The simplification through ordering can only apply where there is a generali-
zation to be expressed.

More is involved in the question of ordering than simplicity. Often
an unordered system will actually make a different, and unwarranted state-
ment, about language. Consider the example from Bach (1974:45) in Figure 15.
The rule we want to express is the English requirement that certain nouns
must follow a determiner. Figure 15a expresses the unordered sequence. Not
only must the environment for the common nouns be stated, but to guarantee
that proper nouns are only realized elsewhere, every environment they can
appear in must also be stated (only a portion are shown here, the list
would actually be longer). Nouns bear the same relationship to 'verb,'
'adjective,' etc., as common-nouns do to 'not'; the proper noun environments

14a $\begin{bmatrix} -voc \\ +cons \\ -nasal \end{bmatrix} \rightarrow \begin{Bmatrix} [+cont] \ / \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \underline{\quad} \begin{matrix} \# \\ [-voc] \\ [+cons] \end{matrix} \\[2em] \begin{bmatrix} +cont \\ +voice \end{bmatrix} \ / \ \begin{bmatrix} -voc \\ +cons \end{bmatrix} \ \overline{-cont} \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \\[2em] [+voice] \ / \ \begin{bmatrix} +voc \\ +cons \end{bmatrix} \ \overline{+cont} \end{Bmatrix}$

14b $\begin{bmatrix} -voc \\ +cons \\ -nasal \end{bmatrix} \rightarrow \begin{Bmatrix} [+cont] \ / \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \underline{\quad} \begin{matrix} \# \\ [-voc] \\ [+cons] \end{matrix} \\[2em] \begin{bmatrix} +cont \\ +voice \end{bmatrix} \ / \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \ \overline{-cont} \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \\[2em] [+voice] \ / \ \overline{+cont} \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \end{Bmatrix}$

14c $\begin{bmatrix} -voc \\ +cons \\ -nasal \end{bmatrix} \rightarrow \begin{Bmatrix} [+cont] \ / \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \underline{\quad} \\[3em] [+voice] \ / \ \overline{+cont} \ \begin{bmatrix} +voc \\ -cons \end{bmatrix} \end{Bmatrix}$

FIGURE 14

(a)   Noun $\longrightarrow$ Common-Noun/Det___

           Noun $\longrightarrow$ Proper-Noun/Verb___

           Noun $\longrightarrow$ Proper-Noun/Adjective___

(b)   Noun $\longrightarrow$ Common-Noun/Det___

           Noun $\longrightarrow$ Proper-Noun

FIGURE 15

are given unwarranted significance. The rules in 15b, which are ordered, allow the correct relationship to be expressed.

Transformational devices have a saving grace absent in stratificational notation: a unit-by-unit measure of similarity such that no simplifying device can apply apart from actual similarity of content. Thus simplification and ordering in TG matches generalizations. The fact that SG cannot distinguish between the false simplification of Figure 12 and simplification in transformational terms speaks very ill of that system. Certainly the stratificational accusation that transformational devices present artificial generalizations is false and stems from a failure to consider the true motivation for simplicity in a theoretical framework.

The discussion so far has shown that stratificationalists fail in each attempt to invalidate TG. The result of each failure is to point out corresponding areas of inadequacy in SG:

1. SG justifies its devices by extra-theoretical notions.

2. SG fails to save the phonemic level, but cannot value the optimal less-stratified analysis.

3. SG cannot make use of simplification devices to distinguish partially similar from non-similar sets of rules.

THE BASIS OF STRATIFICATIONAL INADEQUACY

Before investigating the problems in SG that go beyond its erroneous criticisms of TG, it would be well to view the areas in which this theory succeeds. Indeed, wherever phrase structure grammar failed to provide an enlightening structural description because of the lack of an additional level, SG, with its many levels, is productive. Synonymous sentences are both derived from one single structure on a higher level. Ambiguous sentences are derived from two alternate higher-level structures. With the quite abstract sememic level, there is undoubtedly the ability to express type of sentence (interrogative, negative, etc.) and grammatical function (subject, object).

The criticism here is that SG fails in a much more basic function - in its ability to predict the nonarbitrary character of much of linguistic output. Thus predictive power is two-edged: we must test a theory not only to insure that 'correct output' is included in its set of possible outputs, but we must also insure that the theory does not predict as possible those realizations which are clearly excluded by the rules of the language, or by human languages in general.

The deeper failure of stratificational grammar to adequately characterize language will be discussed in the following section. The criticisms involve three main areas:

1. The failure to value natural class.

2. The inability to distinguish arbitrary and non-arbitrary.

3. The purposelessness of stratificational devices within the system itself.

The Natural Class Argument

A major claim made by SG is that the linguistic system contains no actual linguistic content. Since, in this view, there is nothing to pressure the system into an organization determined along linguistic lines - except for the eventual phonetic output - the internal organization must be determined by the nature of the structures used. Insofar as these structures resemble networks, a study of the simplicity requirements of networks hooked up to phonetic output will specify the linguistic system.

One of the most important aspects of theory construction is to test the predictions of the hypothesis against reality. This separates theory from speculation and ensures continual advancement. Stratificationalists have not tested their theory's most fundamental assumptions - areas where SG's predictions are most likely to fail. If the internal linguistic system does not form generalizations on the basis of phonetic content, then this predicts that the phonetic patterning of the data should be highly random. Indeed, alternation sets should involve phonetically unlike elements more often than like ones, since there are more possible random combinations. This is an empirical matter which simply requires a study of language to test it.

In contrast, by setting up a system with underlying content and requiring rules to act on the content of an underlying form to produce an output, TG predicts that realization sets will most often contain phonetically similar segments. Studies of human languages note that certain realization sets, natural classes, are much more common in language than others.

> Specifically, it is almost always taken for granted
> that phonological segments can be grouped into sets that
> differ as to their "naturalness." 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. (Chomsky and Halle, 1968:335)

Certain phonetic forms are more highly 'suspect' as being variants.
Thus forms [t d t' d'] will be expected to undergo the same kinds of rules,
participate in the same kinds of alternations, and generally form a set or
natural class that is subject to a certain set of rules. On the other hand,
the set [t m e r] would be wholly unexpected. The experience of linguists
has shown over and over that sets like the former occur frequently, while
sets like [t m e r] rarely if ever occur.

> Morphophonemic elements which fall into classes from
> the point of view of rules of the grammar, from the point
> of view of restrictions on combinations, from the point
> of view of historical changes, dialect variations, indeed
> from every known linguistic point of view, have phonetic
> realizations with a high degree of similarity.
> (Postal, 1968:58)

Thus it is a fact of language that the data falls into similar sets
with respect to the rules or alternations they undergo.

> These judgments of "naturalness" are supported
> empirically by the observation that it is the "natural"
> classes that are relevant to the formulation of phono-
> logical processes in the most varied languages . . . .
> In view of this, if a theory of language failed to
> provide a mechanism for making distinctions between
> more or less natural classes of segments, this
> failure would be sufficient reason for rejecting
> the theory as being incapable of attaining the
> level of explanatory adequacy. (Chomsky and Halle, 1968:335)

SG, however, cannot account for these facts of language. Figure 16a
depicts three natural classes in stratificational formulation. These repre-
sent the full set of vowels, stops and affricates for some hypothetical
language. The lines rising from the realizations indicate that each set
participates in some alternation A→B/QAZ, where A can be any member of the
set. Clearly stratificational notation is able to depict such a situation.

(a)

x   y   z

a   e   i   o   u   p   t   k   f   v

(b)

F   G   H

a   e   i   o   u   p   t   k   f   v

(c) $x = 5$ $F = 4$
        $y = 3$ $G = 3$
        $z = 2$ $H = 2$

(d)   F $\longrightarrow$

$$
\overset{e}{\begin{bmatrix} +voc \\ -cons \\ -high \\ -low \end{bmatrix}}, \quad
\overset{p}{\begin{bmatrix} +con \\ -voc \\ -high \\ -back \\ +ant \\ -cor \\ -cont \\ -nas \\ -stri \end{bmatrix}}, \quad
\overset{k}{\begin{bmatrix} +cons \\ -voc \\ +high \\ +back \\ -ant \\ -cor \\ -cont \\ -nas \\ -stri \end{bmatrix}}, \quad
\overset{v}{\begin{bmatrix} +cons \\ -voc \\ -high \\ -back \\ +ant \\ -cor \\ -cont \\ -nas \\ +stri \end{bmatrix}}
$$

X $\longrightarrow$

$$
\overset{a}{\begin{bmatrix} +voc \\ -cons \\ -high \\ +low \\ +back \end{bmatrix}}, \quad
\overset{e}{\begin{bmatrix} +voc \\ -cons \\ -high \\ -low \\ -back \end{bmatrix}}, \quad
\overset{i}{\begin{bmatrix} +voc \\ -cons \\ +high \\ -low \\ -back \end{bmatrix}}, \quad
\overset{o}{\begin{bmatrix} +voc \\ -cons \\ -high \\ -low \\ +back \end{bmatrix}}, \quad
\overset{u}{\begin{bmatrix} +voc \\ -cons \\ +high \\ -low \\ +back \end{bmatrix}}
$$

(e)

X $\longrightarrow$ $\begin{bmatrix} +voc \\ -cons \end{bmatrix}$
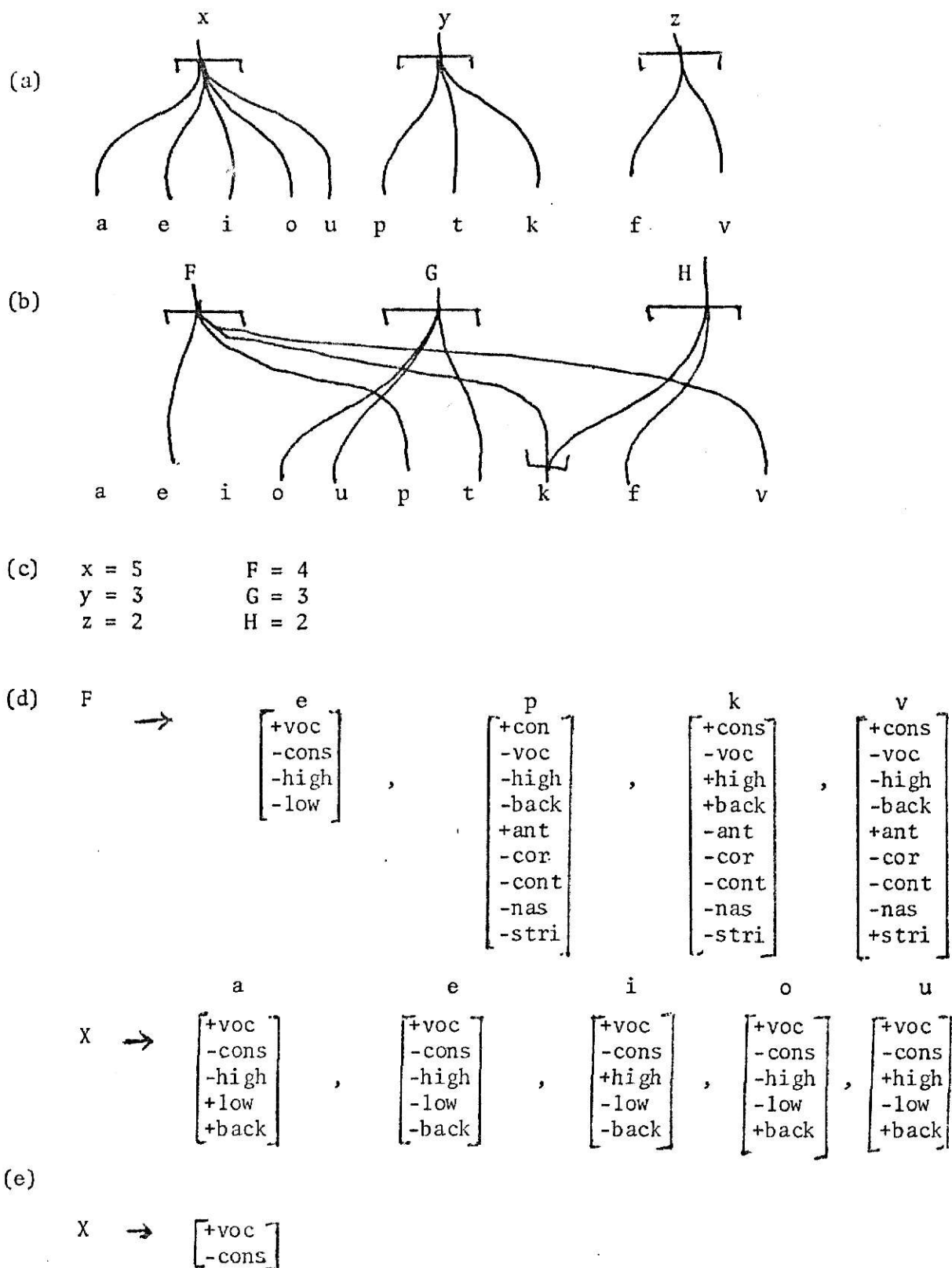
FIGURE 16

In 16b, some hypothetical rule involves realization sets that are far from natural, varying widely and wildly. These groupings should not be expressed as a generalization, since there is nothing similar in the content: they are random. An adequate simplicity count will be able to distinguish law-less from law-governed combinations.

The stratificational counts for these diagrams are presented in 16c. The arbitrary sets G and H are valued equally with the similar sets Y and Z. Even worse, the improbable F is valued more highly than completely regular X. Clearly simplicity here is not designed to separate generalizations from non-generalizations. (Stratificationalists may object to this use of their simplicity measure, which according to Lockwood's formulation of it (1972:38; 59-59), is not designed to choose between solutions that have different effective information. This amounts to the same conclusion, however: the simplicity measure only rates mechanical simplicity and does not concern itself with evaluating linguistic generalizations.)

The transformational formulation would produce the rules in 16d. Set X can be completely specified by the vocalic nature of all the segments. This allows collapsing to produce the notation in 16e. The value of the generalization involved in X over the dissimilar set in F is immediately shown by the simplicity measure.

The recognition of natural class is a recognition that the patterning in the data is not arbitrary, but is rule-governed. It amounts to assuming that similar items will behave in similar ways, and will behave differently from dissimilar items. Furthermore, different behavior is a product of just those ways in which the items differ. This is 'generalization.' A theory that begins its attempt to explain by assuming the system is arbitrary is

quite misdirected. There is nothing to explain in a random system, by definition. It would be a misunderstanding of science to construct a theory to explain such data, for any generalizations presented would necessarily result from the mechanics of the notation itself.

Therefore without the notion natural class, a linguistic theory simply loses the ability to make significant generalizations. SG can not go beyond explanatory adequacy, for it cannot characterize the notion 'possible human language' in the most elementary way.

The Problem of Arbitrariness

Related to the foregoing argument is the inability of SG to specify the nonarbitrary character of alternations. If we consider a set of affixes and a stem, it is apparent that the stem is realized in a similar phonetic way in each regular combination: 'nation,' 'national,' 'nationalism,' 'nationhood.' Though the stratificational linguist can certainly draw a graph that produces these results, the system itself is unable to explain that the phonetic identity is not just coincidentally alligned with semantic similarity. In Figure 17 the arbitrary phonetic representation of 'national-ism' will eventually produce 'governmentism.' There is no evaluation metric, no grammar-internal reason, that explains why this solution is unlikely.

Certain sets of forms undergo similar rules: vain-vanity, sane-sanity, opaque-opacity. An adequate system will express the alternation with a single rule. Figure 18a shows a stratificational approach. While the tactics are able to correctly characterize the generalization, the realization por-tion requires the rule to be expressed separately for each item. In addition, to allow for realization of the nonalternating portion, extra interstratal lines must be added as in 18b. Clearly the entire realization portion is
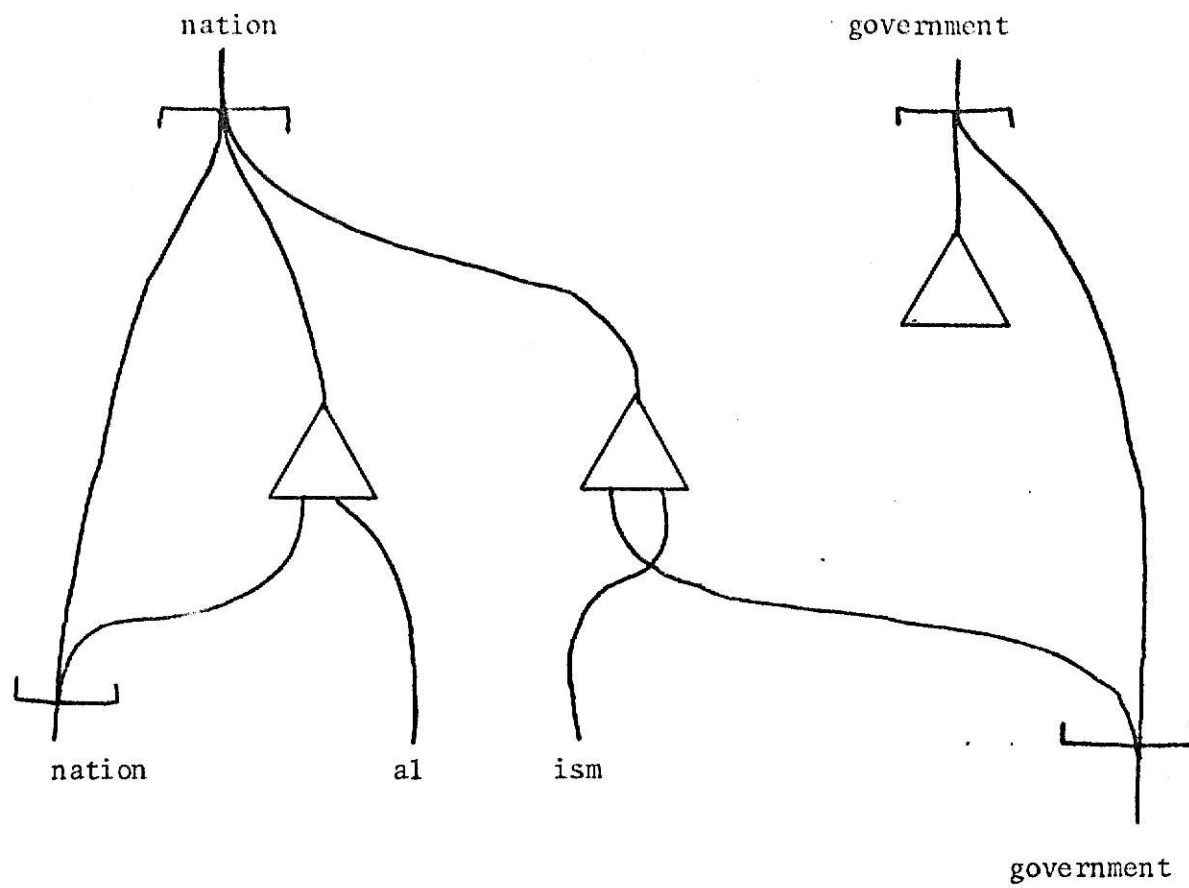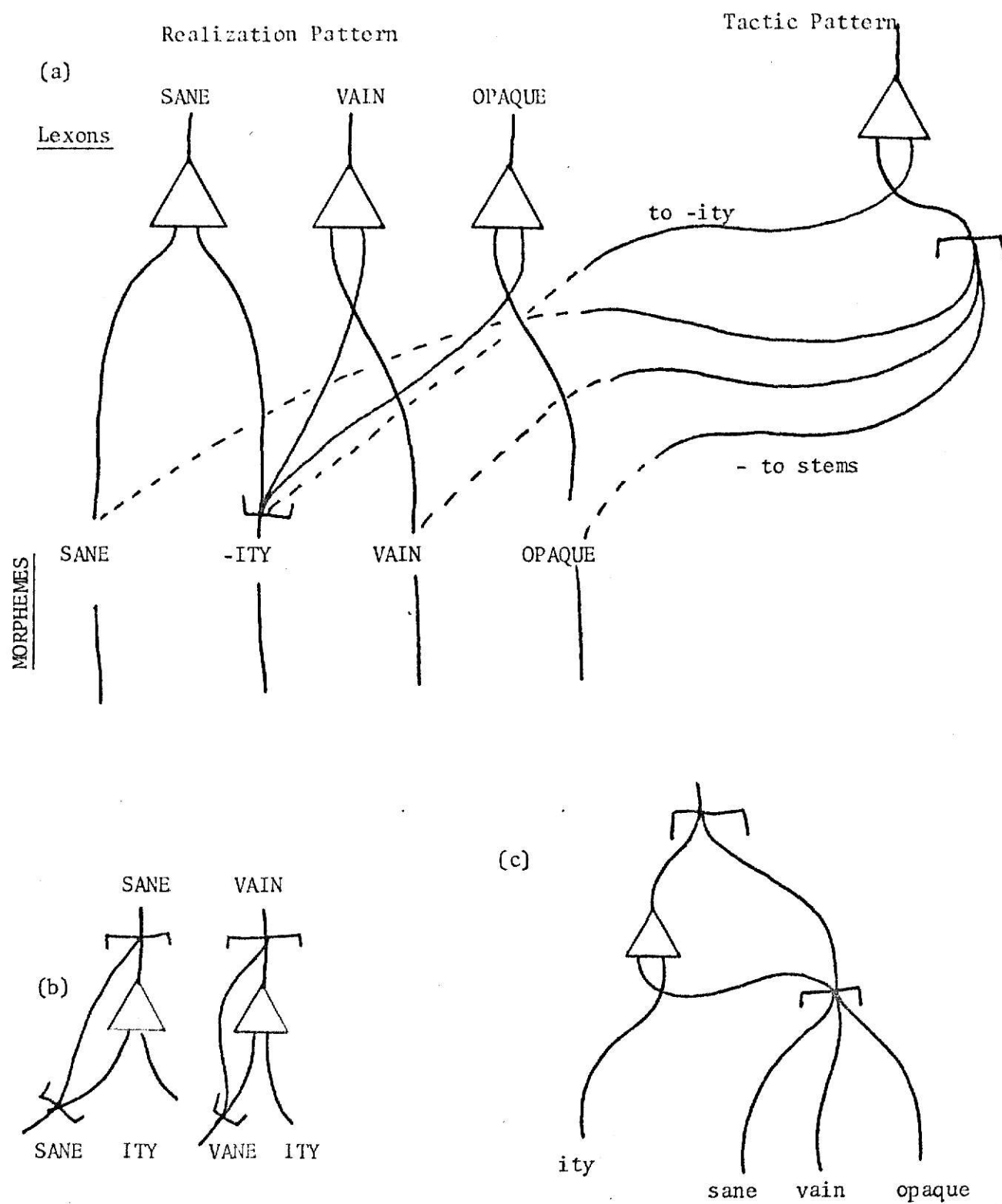
FIGURE 17

FIGURE 18

redundant. It is a mechanical mushrooming necessary simply because there is no natural identity between levels. If some underlying reality is assumed, the alternation can be simply diagrammed, as in 18c.

The Purposelessness of Stratificational Machinery

As we have seen, SG sets itself the goal of describing how competence can be activated. Thus it attempts to show that choices are mechanically determined in a manner made explicit in the theory.

At a certain point in the tactics will be an 'or' corresponding to 'noun.' From this choice point will travel connections to diamond nodes which each represent a noun in the language (see Figure 19). In this state, choices are underdetermined, and a speaker intending to say 'the horse ate the spaghetti' would just as likely attribute the action to a caterpillar or bluejay. To overcome this problem, choices on any lower level are governed by the higher levels.

> Choices in the lower tactics are controlled by
> (lines coming down from) the basic phonemic system.
> But that system's operation is controlled by the
> morphemic system, which also has a tactics, one which
> allows choices to be made by the lexemic system; and
> so forth. (Lamb, 1966d:631)

Thus a signal travels down a realization path, 'lighting up' the connection to a lower level diamond node. At the same time, the tactics of the lower level are stimulated, and the pathways to each noun choice are activated. But only a node receiving two impulses -- one from the realization path and one from the tactics -- will be able to send an impulse to the next lower level. This is shown in Figure 20. The dotted line indicates an impulse travelling along a connective line. Here, only the node corresponding to 'cat' will be able to be realized.
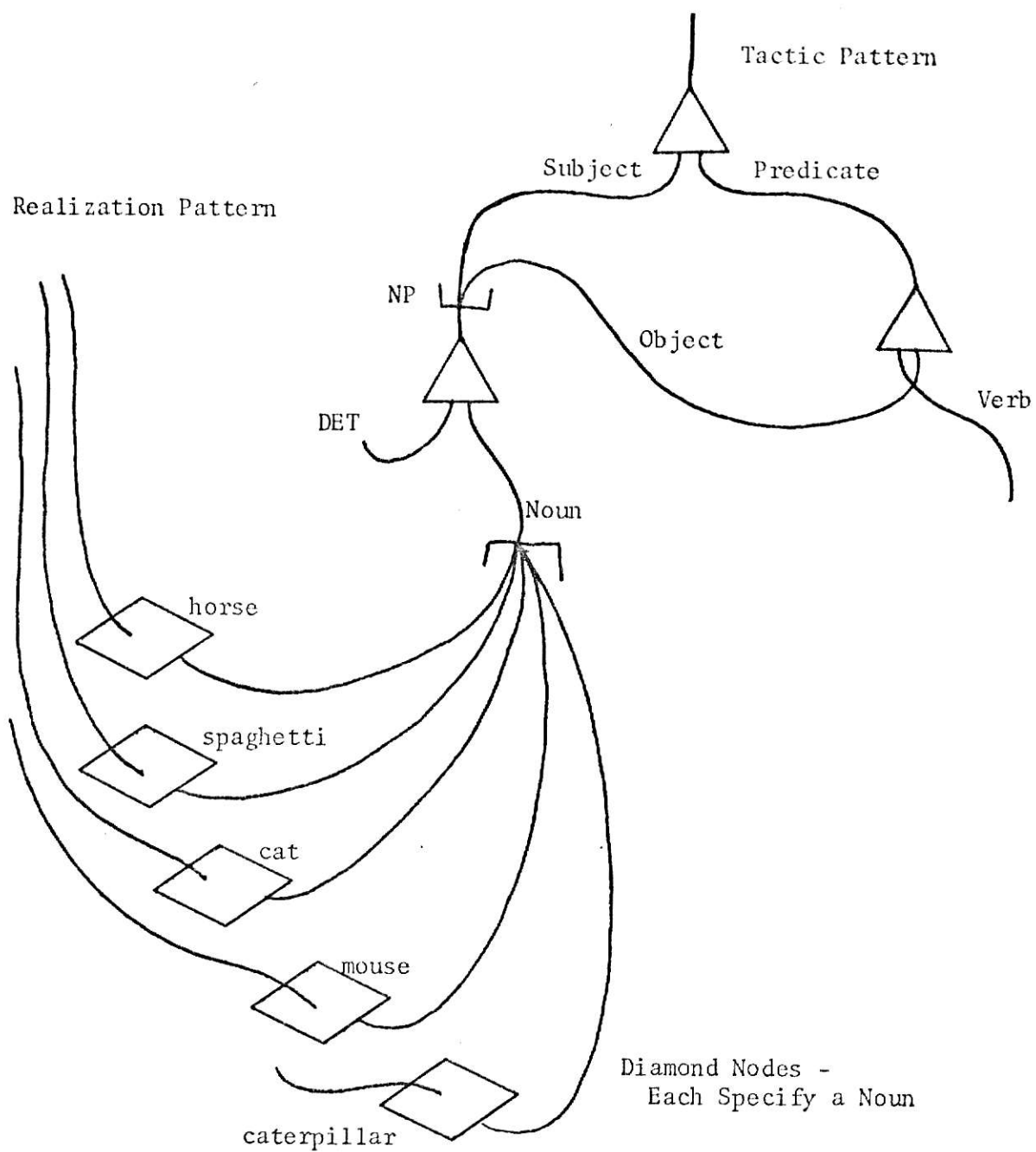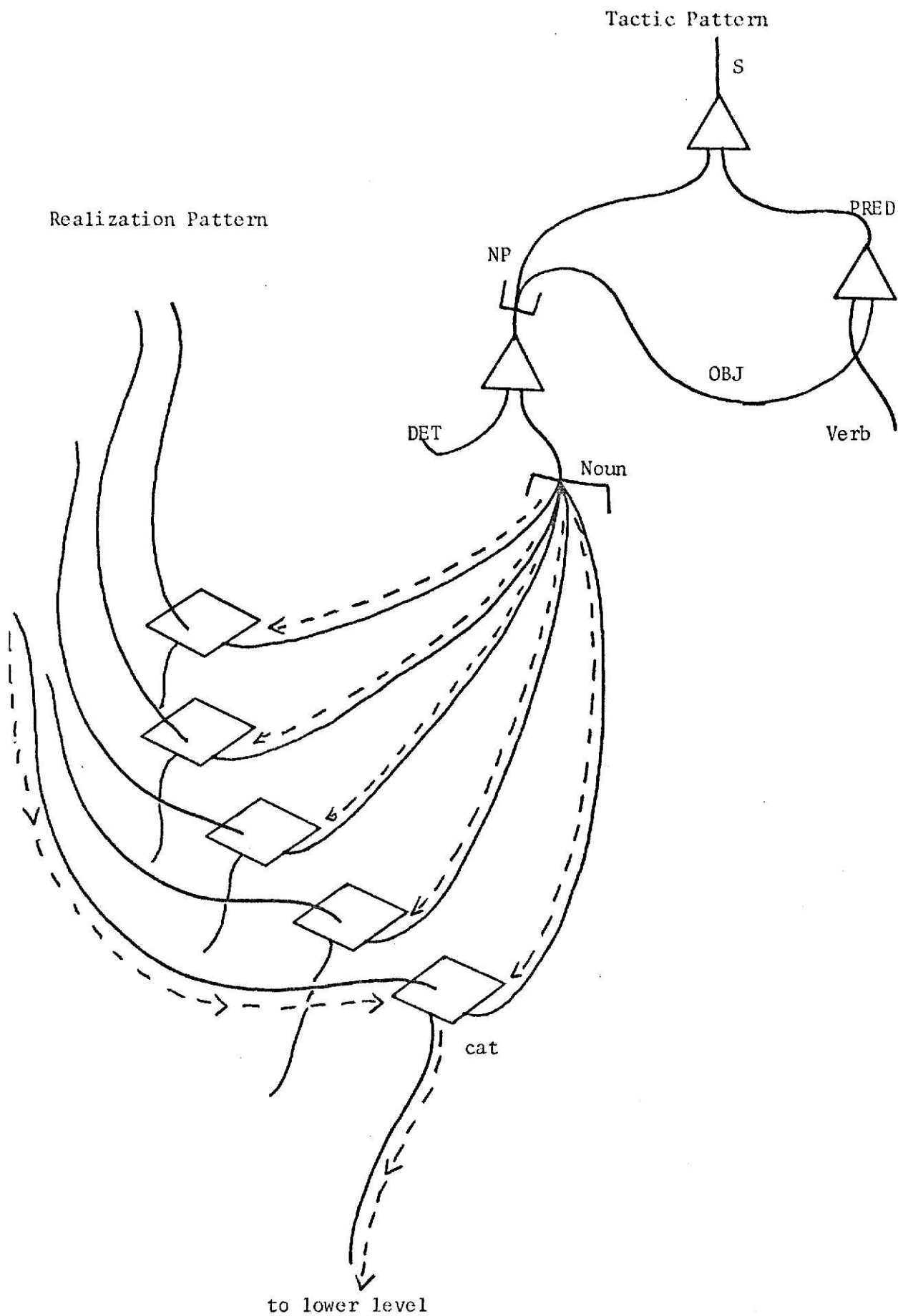
FIGURE 19

FIGURE 20

> When the 'noun' line of the morphotactics is acti-
> vated, we may say that each of the lines coming down
> from the 'or' node is activated, since there is no way
> of knowing at just that point which line to choose.
> The choice is determined by the next higher stratum,
> which activates one of the lines going into these
> diamonds from above. (Lamb, 1970:76-77)

Ultimately, then, choice of item is made outside the linguistic

system. We may wonder what purpose the system serves; clearly it cannot be

to assign concrete substance by a progressive process, since no substance

exists within this system. The response must be that tactics specify

ordering for each level of structure, so that amorphous thought is gradually

arranged in the proper sequence.

The stratificational simplicity requirements dictate that all NP

slots must share the same node. In Figure 20, the lines corresponding to

'object' and 'subject' enter the same NP terminal and are represented by the

same set of diamond nodes. This seems to indicate that the stimulated node

will be ambiguous as regards subject-object position. Speakers might then

produce 'the cat chases the mouse' as 'the mouse chases the cat.'

We can postulate timing in the tactics, so that the subject NP

impulse must arrive first. There will be some difficulty here differen-

tiating between active-declarative NPs, and the optional pre-posing of

clause NPs. Aside from this, even if the tactic subject impulse lights up

the noun choice point before the object signal, the tactics will be unable

to determine whether the incoming realization impulse is meant to be subject

or object. Whatever impulse is coming into the main diamond nodes from the

higher level will be realized when the tactic subject signal arrives.

Thus the incoming realization impulses must be in the correct order,

so that when the subject signal from the tactics arrives at a noun diamond,

it meets a realization signal that is meant to be subject. Thus ordering

in the tactics is irrelevant; ordering has been specified even before the

tactics are reached.

> Therefore all the decisions necessary to produce any
> linguistic form are made before the expression is actualized.
> It is the decision-event, standing outside the linguistic
> structure at the higher end, which sends impulses through
> the network. (White, 1969:194)

The decision-event is far more encompassing than could possibly have

been intended. The result is that all information necessary to produce an

utterance - ordering and item choices - is somehow specified before the

system is entered. For the most part, the machinery provides no information.

With the useless elaboration removed, the result is a simple concept-to-

phonetics realization scheme, where a discretely patterned concept is realized

directly as articulatory signals. At this point we need to start over again

to explain the knowledge of order and choice contained in the concepts.

CONCLUSION

The preceding discussion has shown that not only does SG fail to show serious flaws in one of its major competitors, but it is itself incapable of meeting the requirements of an adequate theory.

This failure stems directly from not testing the central predictions of the theory. The hypothesis that the brain system is devoid of linguistic content and formulated according to network considerations will not produce a system that accurately and specifically characterizes the notion 'possible human language.' Since if the linguistic system in the brain were constructed this way language would not be as we know it, this hypothesis about language and the brain must be mistaken.

By accepting the hypothesis as given and using it to validate the rest of the construction, stratificational grammar violates the principle of falsifiability. By developing an evaluation measure that operates within this unfalsifiable system, the principle that simplicity must accord with generalization is violated. As a result, the theory is unable to distinguish true from false explanations. Thus it violates the principle of generalization and is devoid of explanatory power.

It is quite possible that network notation and strata could be used to graphically characterize language. The fault here is not with the kind of notation employed but with the process of developing it. But rather than deal with the real empirical and theoretical issues involved, stratificationalists have treated these as matters of conviction, preferring to base their proof on popular appeal:

> Stratificational grammar gives an intuitively more
> satisfying picture of language organization than any
> other proposal yet made. (Gleason, 1964:95)

And they have defended innovations not by demonstrations of adequacy, but
by ridicule:

> The process way of thinking is similar to that
> indulged in by the many people who believe that man
> is descended from the ape. The more advanced view
> is of course that man and the ape are descended from
> a common ancestor which was not the same as either.
> (Lamb, 1966c:35)

The careful reader will not be fooled into thinking such analogies can in
any way act as linguistic proof. What is needed is a new beginning, free
of such a slanted approach - that involves a careful and thorough testing
of all predictions, and a weeding out of those devices thus falsified.
This loss of favored conceptions is the risk the theorist must willingly
take in the search for valid explanations.

An alternative of SG would require some revision of the relations
between strata so that outputs similar to their higher level inputs were
more valued than dissimilar realizations. To incorporate this implies some
means of discerning similarities between nodes, which would seem to require
a less abstract conception of underlying representations. A revised simpli-
city measure could then be introduced which would have to take into account
the amount of 'change' reflected between inputs and outputs. That is, it
would have to do more than count identical lines. If these problems were
attacked, SG might indeed provide new insights into the nature of language -
or at least a viable alternative to TG and other theories. It would be
interesting to view the results.

Linguistics has only too recently stepped into the arena of explicit
theory development. It is to be expected that errors will be made, that
many theoretical attempts must come and go as the discipline as a whole
strives to come to terms with the meaning of theoretical adequacy. There

is no shame in such misformulations, but it is necessary to determine how and why they fail. Then as efforts in the right direction, they can contribute a great deal to our understanding in general. Too readily what is disliked is rejected, and what appeals is snatched up with no thought for scientific validity. These theoretical efforts move us closer to what is needed: a much more critical and scientifically guided attitude by all towards theory.

NOTES

[1]An attempt has been made to keep this and the following diagrams as near to stratificational practice as possible. Nevertheless, they undoubtedly differ in details from the graphs a stratificationalist would draw for the same data. These minor differences should not, however, affect the argument here, which focuses on the nature of the nodes which represent phonemic level entities.

[2]This example is given by N. Chomsky and M. Halle, The Sound Pattern of English (New York: Harper and Row, 1968), pp. 340-341. 17a refers to the situation: (1) /ptk/→ [φθx]/ [+vowel]____(but not in the environment____[+vowel]); (2) /ptk/→ [φ ϸ γ]/$\begin{bmatrix} +cons \\ -vowel \end{bmatrix}$____+vowel ; -cons (3) /s/→ [z] / [+liquid]____ . 17b refers to the situation: (1) same as 17a; (2) /ptk/→ [φ ϸ γ]/ [+vowel] ____ [+vowel]; (3) /s/ → [z]/ ____[+vowel].

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THE STRATIFICATIONAL-TRANSFORMATIONAL CONFLICT
AND THEORETICAL ADEQUACY

by

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AN ABSTRACT OF A MASTER'S THESIS

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Stratificational grammar launches several attacks against transformational grammar, each of which is invalid and reflects errors in stratificational theory itself. It argues that transformational notation, especially process formulation, is unreal. But the stratificational notion of reality is based on an untested theory about the brain and a principle of notational superiority otherwise unknown in science. It also argues that transformational grammar misses generalizations by not incorporating strata and presents false generalizations by misusing ordering. This paper argues that it is the stratificational system which is incapable of valuing generalizations over nongeneralizations and that the notion of strata is insufficient to produce an optimal theory.

Stratificationalists seem to assume that language must "look like" the brain, but their hypothesis about brain behavior is falsified by the observation that language is overwhelmingly patterned according to natural classes. As a result, stratificational theory is unable to characterize the concept "possible human language" in the most basic way. Finally, this investigation shows that the machinery internal to stratificational theory does not contribute to the production of an utterance: all details of ordering and choice must be present in the input to the linguistic system.

Stratificational grammar is misformulated as a scientific theory, violating each of the guidelines for logical theory construction; and thus it has no explanatory power.