RICE UNIVERSITY

German and English Noun Phrases:
A Transformational-Contrastive Approach

by

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A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF

Master of Arts

Thesis Director's signature:

James E. Lipkaud

Houston, Texas
April, 1971
Abstract: German and English Noun Phrases: A Transformational-Contrastive Approach, by Ward Keith Barrows

The paper presents a contrastive approach to German and English based on the theory of transformational grammar. In the first chapter, contrastive analysis is discussed in the context of foreign language teaching. It is indicated that contrastive analysis in pedagogy is directed toward the identification of sources of interference for students of foreign languages. It is also pointed out that some differences between two languages will prove more troublesome to the student than others.

The second chapter presents transformational grammar as a theory of language. Basic assumptions and concepts are discussed, among them the central dichotomy of competence vs performance. Chapter three then presents the structure of a grammar written in accordance with these assumptions and concepts. The universal base hypothesis is presented and adopted. An innovation is made in the componential structure of a transformational grammar: a lexical component is created, whereas the lexicon has previously been considered as part of the base.

Chapter four presents an illustration of how transformational grammars may be used contrastively.
After a base is presented for English and German, lexical components and some transformational rules are contrasted.

The final chapter returns to contrastive analysis, but discusses it this time from the point of view of linguistic typology in general. Uspensky's proposal of a metalanguage as a universal standard of comparison is shown to be analogous to the transformational-contrastive approach as presented here.
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Introduction

The following paper attempts to demonstrate how contrastive analysis and transformational-generative grammar (1) can be combined in the comparison of two natural languages. Some of the assumptions which underlie this investigation might be mentioned here, for they are largely undefended in the text.

First, I assume the validity and viability of transformational grammar and of contrastive analysis, and I also assume that their combination can provide a workable basis for the comparison of two languages.

I also assume that the reader has at least a passing acquaintance with the theory of transformational grammar, as developed by Noam Chomsky. That is, I assume a working knowledge of the abbreviatory devices and notations.

Knowledge of German grammar is taken for granted.

The first section contains a few preliminary remarks concerning contrastive analysis.

Sections 2 and 3 present some basic concepts within the theory of transformational grammar and the structure of a grammar constructed in accordance with such a theory. These two sections are based chiefly on the work of Noam Chomsky (2).

Syntax is stressed here much more than phonology, and semantics is totally neglected. This is intentional, for
my concern is with syntax only; this does not, however, mean that this is intended as any definitive representation. The discussion is not complete, for mainly nominal constructions are discussed. Similarly, in section 4, certain base rules have not been given (e.g., Aux is not rewritten), and others have stated only to the extent that they involve a constituent of a noun phrase.

Section 4 is probably the most important part of the present paper. I have presented categorial rules which I believe to be language-general, universal; the remaining parts of section 4 are language-specific, and the contrastive approach is used there.

The treatment of the lexicon presented here (section 3.2.) is, to my knowledge, partly innovative. Previous versions (e.g., Chomsky, 1965 and Botha, 1968) included the lexicon in the base as an unordered set of entries. I have separated the lexicon from the base and have imposed an order upon its entries. (This is discussed and justified below.)

The particular rules presented in subsection 4.3. were chosen for their ability to show both similarities and differences in certain German and English transformational operations, and for their ability to demonstrate the involvement of noun phrases in these operations.

The final section is a brief typological discussion of the transformational-contrastive approach. Whereas the
first section is a discussion of contrastive analysis as a pedagogical device, the final section deals with contrastive analysis from the point of view of typology. In the final section, pedagogical application is seen as one criterion for the evaluation of contrastive analysis.
1. A Note on Contrastive Analysis

Often used in foreign language instruction, the principles of contrastive analysis are quite simple. Because its widest application is in foreign language teaching, it will be discussed here in this frame of reference. (3)

Learning a foreign language entails learning new structures, and contrastive analysis has the task of specifying just what these are. One of the basic assumptions is that the teacher need spend little or no time teaching aspects of the target language which are identical to those of the native language; the emphasis is on teaching (foreign language) structures which differ from those of the native language, for it is here that the student's language is likely to interfere with the learning of the new one. If an English speaking student has problems with the inflection of German articles, verbs, nouns, etc., the reason is probably one of the following:

1) The German feature is totally lacking in English: the lack of grammatical gender in English, for example, might cause the student to decline all inanimate nouns as neuter in German.

2) There is a partial similarity to English. Both languages inflect verbs for number and person, and both inflect nouns. The problem for the English speaking student of German is not only that the forms are different, but that there are none of them; that is, the German inflectional system is more
extensive, with nominal forms inflecting in all situations in which English forms inflect, and in many additional situations.

By pointing to the differences between two languages, contrastive analysis directs the teacher to those points which cause the most interference and which therefore require the most attention. The inflection of noun phrase constituents is one such point for the American student of German. There are two basic reasons for this. First, inflection of determiners and prenominal adjectives is compulsory in German and, as Moulton points out, "precisely because they are compulsory, inflected forms must be learned" (4). Second, there is partial similarity between English and German in this respect, as mentioned above. (The exact nature of the "case system" of English has been debated (5)). This partial similarity is a source of interference for the student.

The differences between two languages can be considered as a set of problems of varying degrees of complexity and difficulty. Robert Stockwell discusses a "hierarchy of difficulty" constructed "on the assumption that some correspondences are more difficult to master than others (included as correspondences are those instances where a rule in one language finds no corresponding rule in the other, or where a category in one is unmatched by a category in the other." (6)
Stockwell's hierarchy excludes considerations of usage, including "dictionary equivalence, propriety, situation and culture." In order to state the nature of the correspondences, the grammatical features of a language are classified as follows. The choice of a feature in the construction of a sentence may be obligatory (Ob), optional (Op) or totally lacking (Ø). Inflection of adjectives, for example, is obligatory in German (prenominally), but lacking in English; according to the hierarchy set up by Stockwell, given below, this would be a type I correspondence. The actual choice of an adjective to modify a noun is optional in both languages and is thus a type 7 correspondence. Stockwell arranges his hierarchy as follows:

<table>
<thead>
<tr>
<th>English</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ø</td>
<td>0b</td>
</tr>
<tr>
<td>I 2 Ø</td>
<td>0p</td>
</tr>
<tr>
<td>3 0p</td>
<td>0b</td>
</tr>
<tr>
<td>II 4 0b</td>
<td>0p</td>
</tr>
<tr>
<td>5 0b</td>
<td>Ø</td>
</tr>
<tr>
<td>6 0p</td>
<td>Ø</td>
</tr>
<tr>
<td>III 7 0p</td>
<td>0p</td>
</tr>
<tr>
<td>8 0b</td>
<td>0b</td>
</tr>
</tbody>
</table>

Stockwell adds that "more important than the ranking within groups is the ranking of the groups themselves, shown by Roman numerals: these correspond very well with
intuition and experience about what problems are most difficult."

Group III represents those correspondences in which two languages are most similar. One component of the grammar presented below applies equally to both English and German; this component would correspond to group III in Stockwell's hierarchy. The other components can be used contrastively with more effect.

The idea of contrasting two languages by comparing the rules in their respective (transformational) grammars is not totally new. Banathy, Trager and Waddle advocate the combination of contrastive analysis and transformational grammar on a general basis: "Prerequisite to the preparation of a contrastive linguistic analysis are adequate linguistic descriptions of the native language of the student and of the target language. A careful comparison of the two systems will furnish data for the contrastive analysis." (8) They proceed to an outline of how one might select such data:

A specific instance of a plausible list of target elements might be useful.... Utilizing the work of Noam Chomsky and his followers on generative grammar and transformations, along with some of the more valid traditional notions, a textbook writer of a course in English might decide that the first items to be taught would be kernel sentences, derived by phrase structure and obligatory transformations only.... (9)
Banathy et al. also indicate that Chomsky's theory is potentially very useful for contrastive analysis:

one area of linguistic investigation in which very little contrastive work has been done is the field of transformational grammar. Since so much of importance in the description of the syntax of English and the grammar which underlies the syntactical structures has been done by such men as Chomsky and many others, it would seem that contrastive studies in the kernel sentences and transformation rules of source and target languages would yield extensive data in precisely that area of language in which the structuralists have obtained the fewest results: the structure of the whole sentence. (10)
2. Some Basic Notions of Transformational Grammar

In *Syntactic Structures*, Chomsky defines a language as "a set (finite or infinite) of sentences, each finite in length and constructed out of a finite set of elements." (11) As a specification of how sentences are constructed, a grammar is a description of a language. But within the framework of the theory of transformational grammar, a grammar is also "...a description of the ideal speaker-hearer's intrinsic competence," (12) and a theory of what the ideal speaker-hearer must know in order to be able to construct and understand sentences in his language.

The difference between competence and performance is central to the theory of transformational grammar. Whereas competence refers to the speaker-hearer's knowledge, performance refers to the actual use of the language in concrete situations. (13) Performance refers only to the speaker, while competence refers to both speaker and hearer (i.e., its reference is not restricted to either of them). Performance refers to the actual processes of speaking, to phenomena which are directly observable. Competence deals with "mental processes that are far beyond the level of actual or even potential consciousness" (14) (and competence is thus not equivalent to what the speaker-hearer may report about
his language).

As a linguistic theory, transformational grammar is not as concerned with performance as it is with competence. A grammar designed according to the principles of this theory is an attempt at a competence model; it is both a statement of the rules of the grammar of a language and a characterization of the ideal speaker-hearer's knowledge. (Chomsky identifies such a statement of rules with such a characterization, claiming that the human mind is an object of linguistic study (15)). Competence is the mental facility which underlies actual performance.

The dichotomy between competence and performance finds a partial analog in the distinction between deep structure and surface structure. A transformational grammar is typically divided into three parts: a syntactic component, a semantic component and a phonological component. (16) The output of the syntactic component is interpreted by the other two components.

The syntactic component is itself further divided into two subcomponents, the base (or categorial sub-component) and the transformational subcomponent. The base generates strings of symbols called preterminal strings; lexical substitution converts these to
terminal strings. The structure of a string can be represented by a phrase marker. Structures generated by the base are called "deep structures" (17) and they are converted to "surface structures" in the transformational subcomponent. A surface structure is the "actual organization of the physical signal into phrases of varying size, into words of various categories, with certain particles, inflections, arrangement, and so on." (18) Since the final form of the surface structure is thus mainly determined by the deep structure, and since each sentence has both deep and surface structure, one says for a given sentence that its deep structure underlies its surface structure. As Chomsky says, "the basic notion defined by a transformational grammar is: deep structure $M_d$ underlies well-formed surface structure $M_s$". (19) As competence underlies performance, then, the more abstract deep structures underlie the more concrete surface structures.

I would like to conclude this section by returning to the question of what a grammar is, for this involves a serious problem for the theory of transformational grammar. I have presented these definitions of a transformational grammar:

1) a description of a language;
2) a description of the ideal speaker-hearer's intrinsic competence, i.e., a
characterization of his knowledge of his language;
3) a statement of rules for sentence formation; an ordered set of rules which enumerates the full set of sentences of the language;
4) a tripartite set of rules which assigns to each sentence a deep structure, a surface structure, a semantic interpretation and a phonological interpretation.

But a grammar has at least one more function: it distinguishes well-formed sentences from ill-formed sentences. (20) Well-formed sentences cannot be described in terms of acceptability to native speakers, either, for acceptability is, as Chomsky says, "a concept which belongs to the study of performance, whereas grammaticalness belongs to the study of competence.... Grammaticalness is only one of many factors that interact to determine acceptability. Correspondingly, although one might propose various operational tests for acceptability, it is unlikely that a necessary and sufficient operational criterion might be invented for the much more abstract and far more important notion of grammaticalness." (21)

If a grammar is correctly written, it will predict the grammatical sentences of a language; but the problem is in determining whether the grammar is in fact correctly written, i.e., whether all of the sentences it generates are grammatical, and whether it generates
all grammatical sentences. Unfortunately, the only method presently available for making such a determination is that of asking native speakers for their judgements on a corpus of sentences. This is unfortunate not only because it tends to equate grammaticalness with acceptability, but also because such a method is not reliable: not all speakers will agree on the status of some sentences. (22)

Chomsky is not optimistic about this problem: "... there is no reason to expect that reliable operational criteria for the deeper and more important theoretical notions of linguistics will ever be forthcoming." (23) Until a better way is found to separate grammatical from ungrammatical sentences, the present method will have to suffice; this method seems to be based chiefly on:

1) the grammarian's own intuition and introspection (if he is a fluent speaker of the language);
2) constructions which are actually encountered (in conversation, reading, etc.);
3) the grammarian's analyses of informants' judgements on the grammaticalness of sentences, and anything else which an informant may report.
3. The Structure of a Transformational Grammar

This presentation of a transformational grammar is based chiefly on the work of Chomsky, but it does not adhere strictly to that model; the difference mainly concerns the lexicon. In this section, I outline my version of a transformational grammar and its operation; in so doing, I concentrate on those aspects of the syntactic and lexical components which involve noun phrases.

The model presented here consists of four parts as opposed to the typical tripartite arrangement of components found elsewhere. This is a result of my having made the lexicon into a separate component, whereas others include it as part of the base. The justification for this can be briefly discussed here.

First, others have proposed that the base is either universal or nearly so; if it is universal, it is obviously not possible for the lexicon to be part of it, for lexical material is (excepting perhaps lexical substitution as a procedure) language-specific, idiosyncratic for each language.

Second, the type of operation found in the lexicon (that is, lexical substitution) is essentially different from that which is encountered in the categorial component; lexical substitution rules are actually more akin
to replacement transformations than to anything else. (24)
At any rate, to maintain that the lexicon is part of the base is not consistent with universal base hypothesis. I have thus chosen to remove the lexicon from the base, and in so doing have removed it from the syntactic component altogether. (25)

The version of a grammar presented here can be represented by the following diagram (Figure 1). In this diagram, 1 represents preterminal strings/deep structures, 2 represents terminal strings/lexical structures, and 3 represents derived strings/surface structures.

3.1. The Base

The base consists of a set of context-free rewriting (branching) rules for generating strings of symbols; such strings are deep structures and as such are preterminal strings. (26) Deep structures are generated in a series of steps, by the sequential application of an ordered set of rules (27) to an initial string and to subsequent intermediate strings. A derivation consists of an initial string, all intermediate strings, and the terminal string derived therefrom; such a derivation can be represented by a branching tree diagram called a base phrase marker.
Figure 1
Each deep structure generated in the base thus has a unique structure, which is part of the information sent from the base to the lexical component and to the transformational subcomponent; this structural information is the basis for the application of rules in both the lexical and transformational parts of the grammar.

3.1.1. The universal base hypothesis

The assertion that all languages have the same base is known as the "universal base hypothesis," but this designation is somewhat misleading, for the hypothesis claims universality for the categorial rules only. (Recall that many linguists include the lexicon in the base.) The hypothesis also claims that the symbols used in the writing of categorial rules is either identical for all languages or else drawn from a "fixed universal alphabet" of symbols. (28) Supporters of the universal base hypothesis who include the lexicon as part of the base are actually misstating their position, for they refer to the universality of the categorial rules but not of the lexicon. (29) Hence, when I separate the lexicon from the base and then claim to support the universal base hypothesis, I make essentially the same claim as the others. I believe the categorial
rules to be universal and I therefore consider the
arguments of others to be in support of my decision
to create a lexical component. (30)

If the universal base hypothesis is true, then the
base need not be stated for the grammar of each parti-
cular language, for it would then belong rather to
general linguistic theory. (31) The actual validity
of this hypothesis is being assumed for this discus-
sion; I have seen no convincing evidence to prove it
right or wrong. Chomsky has indicated his support for
the universal base hypothesis, though cautiously:

... it is... quite natural to suppose that
the formal properties of the base will provide
the framework for the characterization of
universal categories.
To say that this is true is to assume that
much of the structure of the base is common to
all languages.... To the extent that relevant
evidence is available today, it seems not unlikely
that this is true.... The deep structures for
which universality has been claimed may be quite
distinct from the surface structure of sentences
as they actually appear. Consequently, there is
no reason to expect uniformity of surface
structure, and the findings of modern linguistics
are thus not inconsistent with the hypotheses
of universal grammarians. (32)

3.1.2. Branching rules and phrase markers

The mechanism which generates the preterminal
strings is an algorithmic device consisting of a set of
branching rules which rewrite category symbols into
strings of symbols "each of which is either a
terminal symbol which is not later rewritten or a non-terminal category symbol." (33) A rule like \( A \rightarrow B + C \) says that

1. \( A \) is rewritten (analyzed) as the string \( B + C \)
2. \( B + C \) is a \( A \)
3. \( A \) immediately dominates \( B \) and \( C \)
4. \( B \) and \( C \) are the immediate constituents of \( A \)

all of which can be represented by the diagram

```
  A
 /|
/ |
B C
```

and by labeled bracketing:

```
[ [   ] ]   [ [b] [c] ]
   a b c a      a
```

The rewriting of categorial rules continues until the string consists only of terminal symbols (lexical and grammatical formatives). (34) Assuming the categorial rules as in (1) below, the derivation (2) and its corresponding phrase marker (Figure 2) are possible:

(1) (i) \( S \rightarrow NP + VP \)
(ii) \( VP \rightarrow Aux + VG \) (Adv)
(iii) \( VG \rightarrow \{ V_{cop} + PNom \} \)
\( \{ V \) (NP) (PrepP) \}
(iv) \( PrepP \rightarrow Prep + NP \)
(v) \( NP \rightarrow Det + N \) (Pl) (S)
The following labeled bracketings (3) also represent the structure derived above in (2):

\[
(2) \quad S
\]

\[
\begin{align*}
&\text{NP + VP} \\
&\text{NP + Aux + VG} \\
&\text{NP + Aux + V + NP} \\
&\text{Det + N + Aux + V + Det + N}
\end{align*}
\]

\[
S
\]

\[
\begin{array}{c}
NP \\
\text{Det} \\
V
\end{array}
\quad \begin{array}{c}
VP \\
\text{Aux} \\
\text{NP}
\end{array}
\]

\[
\begin{array}{c}
\text{N} \\
\text{V}
\end{array}
\quad \begin{array}{c}
\text{Det} \\
\text{N}
\end{array}
\]

**Figure 2**
There are restrictions on categorial rules, as Bach (35) indicates: categorial rules may neither delete (rewrite as null, $\emptyset$) nor permute symbols; it is also not possible to have a series of rules which has the effect of permuting symbols; only one symbol at a time may be rewritten, and the symbol being rewritten may not appear to the right of the arrow in the rule which rewrites it (e.g., $A \rightarrow A+B$).

Using a notational convention in which $(X,Y)$ represents an $X$ which is immediately dominated by a $Y$, the following grammatical functions can be defined by the relationship "is immediately dominated by":

(4) (i) $(NP,S)$----- subject of sentence
(ii) $(VP,S)$----- predicate of sentence
(iii) $(NP,VG)$----- direct object of verb
(iv) $(V,VG)$----- main verb
(v) $(NP,PrepP)$-- object of preposition

(36)

In this manner, the branching rules of the base generate deep structures; as Chomsky says, "the function of the categorial component is to define the system of grammatical relations and to determine the ordering of elements in deep structures." (37)
3.1.3. Pro-forms

Consider the following sentences:

(5) (i) Jack is nimble.
(ii) Wes Montgomery died last year.
(iii) The boy stood on the burning deck.
(iv) The Lord is my shepherd.
(v) The class read a play which was written by Goethe.
(vi) Booth shot Lincoln.
(vii) The captain bought a new wristwatch today.
(viii) Children like chocolate.

(6) (i) He is nimble.
(ii) He died last year.
(iii) He stood on the burning deck.
(iv) The boy stood on it.
(v) He stood on it.
(vi) He is my shepherd.
(vii) The class read a play which was written by him.
(viii) It read a play which was written by Goethe.
(ix) It read a play which was written by him.
(x) He shot Lincoln.
(xi) Booth shot him.
(xii) He shot him.
(xiii) He bought a new wristwatch today.
(xiv) The captain bought it today.
(xv) He bought it today.
(xvi) Children like it.
(xvii) They like chocolate.
(xviii) They like it.

The deep structures of all the sentences in (5) can be generated by rules like those in (1). Since these rules do not account for pronouns, they cannot generate the deep structures for the sentences in (6) unless there is a transformational rule which later
replaces nouns with pronoun forms, or unless the element "pronoun" is added to the base rules. A transformational rule to replace nouns would need to be stated in such a way as to prevent adjectives and determiners from preceding the pronoun forms:

(7) (i) *The he is nimble.
(ii) *The he died last year.
(iii) *The boy stood on the burning it.
(iv) *The he is my shepherd.
(v) *The he bought a new it today. etc.

The sentences in (7) are, of course, ungrammatical because pronouns cannot be preceded by determiners or adjectives in English. (40) The formulation

(1,v) NP → Det+N (Pl) (S)

allows the generation of the sequence ...Det + N..., and if a later pronominalization transformation merely replaces N by a pronoun, ungrammatical sequences like ...Det + Pronoun... will result. Of course, this transformational rule could be made to delete the item Det or Adj while replacing N by a pronoun. There are, however, reasons for arriving at sentences like those in (6) in a different manner.

In each sentence in (6) the pronouns occupy positions not of nouns, but of whole noun phrases; that is why there are no grammatical sequences of ...Det + Pronoun..., or ...Det + Adj + Pronoun.... That this is the case is
demonstrated by the following sets of sentences:

(5,iii) The boy stood on the burning deck.
(6,iv) The boy stood on it.
(7,iii) *The boy stood on the burning it.

(5,vii) The captain bought a new wristwatch today.
(6,xv) He bought it today.
(7,v) *The he bought a new it today.

As these sentences show, the result of such a replacement transformation would be grammatical in all cases only if the rule were made to replace whole noun phrases and not just nouns. But it is possible to achieve the same result and simplify the grammar considerably by modifying rule (1,v) so that the element Pro is included:

\[
\begin{align*}
NP & \rightarrow \{ \text{Det + N (Pl) (S)} \} \\
& \quad \{ \text{Pro} \}
\end{align*}
\]

The element Pro thus occupies exactly the positions that other NPs occupy. Pro is later replaced by the proper pronoun form, and there are no strings \text{...Det + Pro...} because these two elements are now mutually exclusive. The string \text{...Adj + Pro...} will not occur because the transformational rule which shifts Adj to prenominal position will be stated so that it will do so only when it is the symbol N which NP immediately dominates.) In terms of the grammatical functions
defined above in (4), "pronoun" can thus be defined as (Pro,NP).

Another reason for proposing the element Pro as an alternative to Det + N is that such pro-forms seem to exist for other categories, also. Consider the following:

(8) (i) I know five such men.
(ii) Such a story is really frightening.
(iii) I didn't do it.
(iv) You did that once already.
(v) I know only one person who talks like that.
(vi) There is my hat.

The material underlined in the first two of these sentences would seem related to adjectives like honest, or to larger phrases like about murder by decapitation; the material underlined in the next two would seem to be related to verb phrases like break the window or go to the movies; the material underlined in the fifth example could be related to a number of different modifiers, and the material underlined in the last sentence might be related to a locative prepositional phrase like on the table.

I would propose that this material is represented in the deep structure by pro-forms, e.g., (Pro,VP), (Pro,Adj), etc. The proposal of the element Pro as an alternative to Det + N would thus seem motivated on at least two grounds:
1) It simplifies the grammar by reducing the number of operations performed in pronominalization, and actually eliminates the need for a pronominalization transformation in which a given noun or noun phrase is replaced by the proper pronoun form.

2) It conforms to a larger general pattern of the base, as the element Pro may be used for rewriting several categories and not just in rewriting the category NP. (41)

3.2. The Lexical Component

The preterminal strings generated in the base proceed next to the lexical component, which consists of:

1) context-free subcategorization rules
2) a set of lexical entries
3) lexical substitution rules
4) a lexical feature-matching device

The input to the lexical component is thus a set of structured strings consisting of grammatical and lexical formatives; the most important operation performed in the lexical component is the replacement of the lexical formatives by lexical entries. Lexical entries contain the information necessary for the semantic and phonological interpretation of the terminal strings emerging from the lexical component. (42)

The process of lexical substitution itself is quite similar to replacement procedures found in the transformational subcomponent: the replacement takes
place only if certain conditions are met. For lexical substitution, such conditions are expressed in terms of syntactic and contextual features.

3.2.1. Syntactic and contextual features

Contextual features specify the structural frames in which a category representative (43) can (or must) appear. Such features are given for lexical entries which are representatives of the category [+V].

(44) For example, if a verb is transitive (must have an object), then a feature [+___NP] will be specified for it; verbs which are intransitive (must not have an object) are specified with the feature [-___NP]; and those which are unrestricted, that is, can occur with or without objects, are specified as [+___NP], unless there is some further restriction. Regarding transitivity in verbs, there are thus three possible types:

1. discuss, [+V,... +___NP,...]
2. fall, [+V,... -___NP,...]
3. read, [+V,... +___NP,...]

Thus, if a string is generated in the base in which the (VG,VP) is rewritten as V +NP, then this V can be of types 1 or 3 above, but not of type 2. The
choice of a type 2 verb would result in an ungrammatical sentence.

Even though a verb marked \([+V, \ldots +_\text{NP}]\) is chosen for such a string, the result can be ungrammatical if the object noun is not of the proper type. The verb *frighten*, for example, not only requires an object, but the object must also be animate. Other verbs require animate subjects (like *see*); still others may co-occur only with abstract subject or object nouns, etc.

This situation is resolved by the use of context-free subcategorization rules to specify syntactic features for the various occurrences of \(N\) in preterminal strings. Syntactic features are specified in terms of

\[
(9) \quad (i) \text{ common-ness} \\
(ii) \text{ countable-ness} \\
(iii) \text{ animate-ness} \\
(iv) \text{ human-ness} \\
v \text{ abstract-ness}
\]

That is, a noun is either common or proper (+ Com), countable or not countable (+ Ct), etc. In order for the combination of a given noun and a given verb to be grammatical, their syntactic features must be compatible (non-distinct); for example, if *frighten* requires an animate object, this verb is then specified not merely as \([+V, \ldots +_\text{NP}]\), but as
The designation \([+V, \ldots, +An]\) would thus be reserved for verbs which require objects, but whose objects are not restricted according to the syntactic features listed in (9). Likewise, a verb which requires a human subject would be specified as \([+V, \ldots, +Hu]\).

Because the features in (9) are arranged hierarchically, there is some redundancy and it is not necessary to specify a value for all five an any given item. (For example, any item containing the feature \([+Hu]\) will automatically, though unstated, also contain the features \([+Ct, +An]\).) This hierarchic array of syntactic features may be represented by the diagram in Figure 3.

As can be seen, there are ten possible (unique) combinations of syntactic features, each of which represents a type of noun. They can be listed as follows (the features in parentheses are redundant (predictable)):

1. \([+N, +Com, (+Ct), (+An), +Hu]\)
2. \([+N, +Com, (+Ct), +An, -Hu]\)
3. \([+N, +Com, +Ct, (-An), +Abst]\)
4. \([+N, +Com, +Ct, (-An), -Abst]\)
5. \([+N, +Com, -Ct, +Abst]\)
The hierarchy represented in Figure 3 can also be stated as a series of rules (context-free subcategorization rules) in the lexical component. An incoming string is subjected to these rules first so that each
occurrence of N is developed as a set of syntactic features (each set of features making up a "complex symbol"); these rules are:

(10)  
(i)  
N → [±Com]  
(ii)  
+Com → [±Ct]  
(iii)  
-Com → [+An]  
(iv)  
+Ct → [+An]  
(v)  
-Ct → [+Abst]  
(vi)  
+An → [+Hu]  
(vii)  
-An → [±Abst]  

Nouns in the lexicon are also specified (inherently) with regard to syntactic features, so that a lexical entry for a noun A may replace a complex symbol B developed from an occurrence of N only if the features of A and B are compatible (non-distinct).

(There are apparently some specifications of syntactic features for adjectives, also. More exactly, some adjectives are specified as to what kinds of nouns they may modify. Sentences like "green ideas sleep furiously" are unacceptable not only because "sleep" requires an animate subject, but also because the adjective "green" can only modify concrete (-Abst) nouns, and "idea" is abstract. That is, "idea" would be specified as [±N,..., +Abst,...] in the lexicon,
whereas "green" would be specified as
\[
\left[ +\text{Adj}, \ldots +\left[ +\text{N}, -\text{Abst}, +\text{Com}, \ldots \right] \right].
\] (48)

3.2.2. Lexical entries

It is clear from the preceding discussion that contextual and syntactic features are an essential and very important part of each lexical entry. The form of a lexical entry can be more exactly specified here as consisting of six parts, probably in the following order:

1. a phonological "spelling" of the entry (49)
2. the category symbol indicating the part of speech to which the entry belongs (\([+\text{N}], [+\text{V}], [+\text{Adj}], \text{etc.}\) )
3. contextual and syntactic features
4. semantic information
5. transformational information
6. morphological information

Transformational information would include specification of which particular transformational rules must, must not, or may be applied, when this information is idiosyncratic to the lexical item (i.e., not predictable by general rule).

Morphological information is not utilized until the (derived) string (surfact structure) has left the
transformational subcomponent and proceeded to the phonological component. An example of this type of information would be the specification of an inflectional class to which a noun or verb may belong. This is easily demonstrated with German lexical entries; certain German verbs, for example, will be designated as being "weakly" conjugated for past tenses (leben and zeigen, for example), while those which are conjugated "strongly" will be assigned to various ablaut-groups (singen, fahren, etc.). Since nouns do not all form plurals in the same manner, various different class specifications will be used here, also.

Similarly, case-government can be handled by assigning appropriate features to lexical entries. For example, one might establish the convention for German verbs that their objects are assigned to the [+acc] case unless otherwise specified in the lexicon; then verbs like glauben, helfen, danken, etc., can be assigned the feature [...]...+dat...], while others, like harren, entledigen, etc., can be specified as [...]...+gen...]. Case-government would also involve the specification of the features [+dat], [+gen], [+acc], and [+dat/+acc] to German prepositions (e.g., bis, [+Prep, +acc]).
It should be stressed that the lexical entries, as conceived here, are ordered. Transformationalists have maintained that the lexical entries are an unordered set. (50) I am proposing that the entries are ordered in the following manner:

Assume that the following categories have representatives in the lexicon: N, V, Adj, Prep (51). The lexicon is structured so that all representatives of N are clustered together, all representatives of V are clustered together, and likewise for Adj and Prep. The lexicon can then be represented as a tree diagram:

```
lexical entries
  /\   /\   /\
 N   V   Adj Prep
```

Figure 4

The next step in the ordering of the lexical items is the clustering of them within each of the categories; the clustering this time is based on identity or similarity of feature specifications. For example, the class Prep might order itself by case-government features:
Verbs are also clustered, perhaps first according to whether they are transitive (i.e., by identity or similarity of contextual features), then according to the syntactic features of the nouns with which they can grammatically co-occur. Part of a diagram for English verbs might be as follows:
Adjectives, like verbs, might be clustered according to the types of noun with which they may co-occur.

As important as the clustering of any of the other categories is the sub-grouping of the class of nouns. I propose grouping them according to similarity.
or identity of shared syntactic features; this means that the diagram in Figure 3 would provide the organizational scheme. I present this diagram again now with some examples:

```
N
+Com
  +Ct
  +An
    +Hu
      +Abst
        +An
          N
            London, the Ukraine
        -Abst
          ...:
    -Hu
      +Abst
        +Hu
          ...:
        -Abst
          ...:
    +An
      -An
    -Ct
      ...:
    +An
      -An
    -An
      ...:
```
With the lexicon ordered in this fashion, one can begin at the highest node ("lexical entry") and trace a path to a set of (phonological spellings of) entries; symbols are encountered along each such path, one symbol at each node. Each set of entries is located at the terminal point of a maximal path and each item in such a set is specified as having the features given at the nodes dominating that set.

I do not intend to show actual lexical entries in sets at terminal points of such a tree diagram; this diagram (above) merely serves as the basis of the organization of a list. The list would be set up so that the features dominating a set serve as the title for that set. For example, the first group listed might be titled \([+N, +\text{Com}, +\text{Ct}, +\text{An}, +\text{Hu}]\) (or, equivalently, \([+N, +\text{Com}, +\text{Hu}]\)), and then all of the members of that set would be listed, and so on, until all sets had been given in this manner.

One might object that there is no justification or motivation for the imposition of such an order upon lexical entries. But there seems to be no particular justification for the claim that they are unordered, either. I have found some psychological support for the ordering of lexical entries (52), but, even without such support, I think that such an
ordering is at least partly justified on the ground that an ordered set of lexical entries is more convenient to present and is also more readily discussed.

3.2.3. Lexical substitution

After the subcategorization rules presented above have replaced all occurrences of N with complex symbols, lexical substitution can take place. Strictly speaking, lexical substitution is a linguistic universal (53) and lexical substitution rules would thus not be stated in the grammar of a particular language. Like the categorial rules, they would belong to general linguistic theory.

Lexical substitution might proceed along the following lines: the most deeply embedded S is sought out and its lexical formatives are replaced by lexical entries in conformity with the lexical rule as stated by Chomsky (54):

\[(11) \text{If } Q \text{ is a complex symbol of a preterminal string and } (D,C) \text{ is a lexical entry, where } C \text{ is not distinct from } Q, \text{ then } Q \text{ can be replaced by } D.\]

After all lexical formatives in an embedded sentence have been replaced, the operation is performed on that sentence's matrix and so on until the process is complete for the whole structure. There is still a question of an order of application of the lexical
rule, a formula which states that lexical entries are inserted first for category X, and that entries are chosen for category Y in terms of the features of X (so that the result will be grammatical). There are at least three ways to resolve this question.

First, one might consider replacing all occurrences of N in a sentence (i.e., complex symbols which begin with \([+N,...]\)) with nouns; verbs would then be chosen according to the syntactic features of the nouns chosen to be subject and object. Similarly, adjectives would be next, or prepositions; these would follow nouns and verbs, and at least adjectives would be chosen in terms of the features of the nouns they would be modifying.

Second, one could first replace the verb by a lexical entry. This would mean that the first step would be that of determining whether the string contained an \((NP,VG)\). If so, the verb chosen must be specified as \([+V,... +_{\_NP,...}]\) or \([+V,... +_{\_NP,...}]\) (or as \([+V,... +_{\_ [+x, +y],...}]\) where x and y are syntactic features). Again, adjectives and prepositions are dealt with after nouns and verbs.

The former position, inserting nouns first, is taken by Chomsky (55); the latter position, inserting verbs first, is taken by Seuren (56). Both positions
presumably prevent the occurrence of ungrammatical sentences. At any rate, they are based on the concept of a grammar as a device which generates all and only the grammatical sentences of a language. A third approach is also possible, however, which is based on the notion not that a grammar only generates grammatical strings, but that it characterizes that which is grammatical, and distinguishes the grammatical from the ungrammatical; this means making some statements about what is not grammatical. From this point of view, a grammar will generate all the grammatical strings, and many ungrammatical ones as well, but will mark the ungrammatical ones as being ungrammatical. Lexical substitution is seen here as a process which will insert the lexical entry (D,C) into a string for the complex symbol Q, and the only condition on the lexical rule is that the lexical entry belong to the proper grammatical category. Lexical substitution may insert any entry into a string for any complex symbol provided that this one condition is met. Verbs are not chosen in terms of nouns, nouns are not chosen in terms of verbs; adjectives are not chosen in terms of nouns. All are chosen, as Chomsky and Seuren would say, "independently."

One might then ask the purpose of contextual and
syntactic features. After lexical substitution has replaced all complex symbols by lexical entries, a lexic feature-matching device determines whether the sentence (actually, the terminal string) is well-formed regarding the feature compatibility of co-occurring lexical items. If a terminal string is not well-formed in this regard, the lexical feature-matching device determines how and to what extent the string is ungrammatical and marks it as ill-formed (= "ungrammatical"). This marking remains with the string as it passes through the various other components of the grammar. A sentence such as *sincerity was frightened by the boy* thus has the same degree, type and source of ungrammaticalness as *the boy frightened sincerity.*

This point of view sees the syntactic and contextual features as serving to determine well-formedness or deviance in terminal strings. If an adjective like intelligent, or any other adjective marked \( [+\text{Adj},..., +[+\text{N}, +\text{An}] ] \), is inserted into a string so that it modifies a noun marked \( [+\text{N},..., +\text{An},...] \), like pencil, then the lexical feature-matching device will recognize that these features are inconsistent, and will mark the string as ungrammatical. (57)
3.3. The Transformational Subcomponent

After the preterminal strings of the base have been converted into terminal strings by the operation of lexical substitution, and after the lexical feature-matching device has operated, these lexical structures proceed both to the semantic component for semantic interpretation, and to the transformational subcomponent of the syntax (cf. Figure 1).

The transformational subcomponent consists of a set of transformational rules which convert lexical structures into surface structures. The transformational subcomponent has lexical structures (terminal strings) for input and surface structures (derived strings) for output.

I mentioned earlier that the process found in lexical substitution is like a transformational rule. This becomes clear when one considers that lexical substitution is, to an extent, context-sensitive. For the insertion of a lexical entry for a symbol to be grammatical, the features of the entry must be compatible with the features of certain items with which it co-occurs. For example, in replacing the symbol V in the string

\[ \text{Det} - N_1 - \text{Aux} - V - \text{Det} - N_2 \]

the lexical entry to be inserted for V must be marked
with the features specifying the proper category \([+V]\), and indicating that it may (or must) be transitive (i.e., \(+\_\text{NP}\) or \(+\_\text{NP}\)); in addition, its syntactic features must be compatible with those of \(N_1\) and \(N_2\). In other words, the grammaticality of the string is dependent upon the compatibility of (a) an entry's features with (b) the features required in a given context; the lexical feature-matching device must be sensitive to the context established by a and b.

Transformational rules work in a parallel fashion. Each transformational rule has a structural description ("SD") specified for it. (58) The SD states the structure of the strings to which the rule may (or must) apply. If a rule is made to operate on a string whose structure is different from that specified in the SD, then the result is not grammatical (and is marked with an asterisk to indicate ill-formedness); similarly, if a rule must operate on all strings with a given SD, and if the rule is not applied to a string with that structure, the result will likewise be ungrammatical. One must therefore know the exact structure of each string coming into the transformational subcomponent. This is why the structure of a string, determined in the categorial component, remains
a part of the information attached to the string as it passes through the various other subcomponents of the grammar.

A transformational rule operates on a string having the appropriate SD, and (since phrase markers represent such structures) one says that such a rule operates on a phrase marker; a transformational rule changes the structure of a string and may therefore be said to rewrite a phrase marker. (A phrase marker may also be thought of as representing a set of terminal strings.) The output of a transformational rule is thus a rewritten (or derived) phrase marker, and is also called a transform; the tree diagram representing a transform is called a T-marker.

The statement of a transformational rule is in two parts. First is the SD; second is the SC, the structural change effected by the rule. A rule is thus formulated as follows:

\[
\begin{align*}
\text{SD: } & A - B - C - D - E \\
\text{SC: } & 1 \ 2 \ 3 \ 4 \ 5 \\
& 4 \ 1 \ 2 \ 3 \ 0 \ 5 \ (59)
\end{align*}
\]

As mentioned above, if a transformational rule is made to apply to a string not fitting the SD of the rule, the result will be ungrammatical. Similarly, there are cases in which the non-application of a
transformational rule will have ungrammatical results. This defines "obligatory" in regard to a transformational rule: it must be applied, its non-application will be the source of ungrammaticalness. For example, there is a transformational rule which permutes elements in strings of the type

- the man - be+ing - buy - the book

so that the gerundive suffix -ing is attached to the main verb:

- the man - be - buy+ing - the book

(The element be+ing precedes the main verb in the SD because its origin is the category Aux, which precedes VG in the rule which rewrites VP; cf. rules 1,ii and 1,iii.) If this transformational rule (whose SD would be stated quite broadly, e.g., X - be+ing - V - Y) is not applied, the result will be an ungrammatical sentence like

*the man is ingbuy the book
or *the man ising buy the book

On the other hand, some transformational rules are optional; that is, the grammaticalness of a string (with the proper SD) is affected neither by application nor by non-application of the rule. Chomsky proposes that some verbs be marked in the lexicon with the feature [...+object deletion...] (60), to indicate
which verbs may be either transitive or intransitive (like eat) and which may be transitive only (like keep). He proposes that, if a verb like eat is inserted for V in a string like

\[ \text{NP}_1 - \text{Aux} - V - \text{NP}_2 \]

then \( \text{NP}_2 \) may be deleted by an optional deletion-transformation rule. The result would be grammatical regardless of whether the rule is applied. This defines "optional transformational rule."

It should be noted here that, due to the manner in which obligatory transformational rules are stated in the grammar, modifications need to be made on the base as it was presented above. For example, the initial string S must be rewritten so as to include the element S-T ("sentence-type"), thus:

\[ S \rightarrow S-T + \text{Sent} \]

Sent is then rewritten as NP+VP, and S-T is rewritten thus:

\[ S-T \rightarrow (Q) (\text{Neg}) (\text{Pass}) \ldots \]

These are optional elements and, if chosen, will each "trigger" an obligatory transformational rule. For example, if the element (Q) is chosen, "yes-no" questions will result from the application of the transformational rule triggered by the presence of Q
in the string; Neg will similarly trigger a
negation transformation negating the whole sentence
derived from Sent; and the presence of Pass will
trigger the rule which forms passive constructions.
These transformational rules are all obligatory in
the sense outlined above. If a string generated in
the base contains an instance of Neg, for example,
then the negation transformation must be applied
to it in order for the string to become a
grammatical sentence. (61)

The element Pro also triggers a transformational
rule. This is discussed more fully below, but for now
the following may be said. German nouns are inherently
(idiosyncratically) masculine, feminine, or neuter.
They are specified in the lexicon by the features
\[[+N,\ldots +\text{neut}\ldots]\], \[[+N,\ldots +\text{fem}\ldots]\], \[[+N,\ldots +\text{neut}\ldots]\];
the transformational subcomponent also has some early
rules (and some conventions) which assign an
inflectional class to an NP on the basis of
grammatical function. For example, one convention will
state that \[[+\text{nom}]\] is assigned to any (NP,S).
Inflectional classes are also assigned on the basis
of the co-occurrence of an NP with a given type of
preposition (cf. Figure 5), so that, for example,
\text{aus} is marked \[[+\text{Prep},\ldots +\text{dat}]\], and this feature
is assigned to the (NP, PrepP). Another element, (+plural), is stated as an optional item in the base rule which rewrites NP. By the time a string reaches the rules further specifying Pro, number, case, and gender have already been specified. These rules must copy features for gender and number (but not for case), thus:

\[
\begin{align*}
\ldots \ [N_1 \ldots +X, +Y\ldots] \ldots \text{Pro}_1 \ldots & \quad \Rightarrow \\
\ldots \ [N_1 \ldots +X, +Y\ldots] \ldots \ [\text{Pro}_1 \ldots +X, +Y\ldots] \ldots \\
\text{condition: } N_1 \text{ and } \text{Pro}_1 \text{ are co-referential.}
\end{align*}
\]

\(X\) and \(Y\) are feature specifications for gender and number. Later rules will assure that the sequence \([\text{Pro},\ldots +\text{dat}, -\text{pl}, +\text{fem}\ldots]\) will become "der", etc.

The element Pro, generated in the base, thus triggers an obligatory transformational rule. If this rule is not applied, elements like Pro, +pl, +acc, etc., will not be removed from the strings, and these strings will not become grammatical sentences.

Transformational rules are ordered with respect to each other, applying in a given sequence. They also apply cyclically, operating first on the "most deeply embedded phrase marker" (62), then on the next most deeply embedded phrase marker, etc., until they are
finally applied to an S which is not embedded in any phrase marker.

There are basically three types of operation performed by transformational rules: deletion, addition, and permutation (reordering). A transformational rule can perform any of these operations or any combination of them simultaneously.
3.4. The Phonological Component

Most generally stated, the purpose of the phonological component is to assign phonological shape to surface structures received as input from the transformational subcomponent. The output of the phonological component can thus nearly be equated with the speech signal itself. Assignments of phonetic representations to surface structures are made on the basis of the information which the phonological component receives as input. This information includes:

1. the surface structure of each derived string;
2. phonological data from the lexical component: phonological spellings of the lexical entries in each string (63)

The former is used, for example, in assigning an intonation pattern to a sentence; the latter is used in determining the phonetic shape of the individual words in the sentence. For example, the sentence "the boy stood on the deck" would have as a surface structure a string like (12), with the labeled bracketing (13):

(12) the boy past-stand on the deck
The structure represented in (13) contains information regarding the organization of (12) into phrases, which is needed to determine the intonation pattern of the sentence, location and degrees of stress, etc.

Each particular word (lexical entry) contains a phonological spelling (in the form of a matrix), and this determines the phonetic shape of the word. There is, however, some residue, as indicated in (12) by the sequence past-stand.

The strings arriving as input to the phonological component consist of structured strings of formatives. These formatives have three sources: first, there are formatives which are introduced into the string in the categorial component (e.g., +past, +plural, etc.); second, some formatives are introduced by lexical substitution (boy, deck, etc.); third, some formatives are introduced in the transformational subcomponent ([+dat], etc., and derivational affixes, etc.).

When formatives of the first type occur in strings, they are deleted or combined with another element to
form a single (phonologically represented) item, like *stood*, which is the resolution of the sequence *past-stand*; one can state a convention (for English) whereby the sequence *past-*X (where X is an entry for a verb) becomes X-(e)d, and this would determine the phonological form for the past tense of a great many (perhaps most) English verbs. But there are obviously many verbs which must be handled differently, like *stand*. Such verbs are indicated in the lexicon by being assigned features which indicate the conjugational classes to which they belong. This information remains with the entry when it is inserted by lexical substitution, so that the phonological component will interpret sequences like *past-sing*, *past-stand* as *sang*, *stood*, etc.

The treatment of noun plurals is analogous to the treatment just stated for past tense forms of verbs, in the following way. A convention would state the basis for the phonetic realization of a plural noun as X-s (where X is a noun). Nouns which form the plural differently can be assigned in the lexicon to declensional classes, so that the phonology will interpret *mouse-*plural as *mice*, *sheep-*plural as *sheep*, *ox-*plural as *oxen*, etc. In other words, the phonological component needs a subcomponent which
prepares strings for the assignment of phonetic representations (64); the task of such a subcomponent would be to scan each derived string as it emerges from the transformational subcomponent and to apply certain rules which resolve items like noun-+plural, past-+verb, Determiner-+dative, etc. As Chomsky and Halle state, "the grammar must contain certain rules converting the surface structures generated by the syntactic component into a form appropriate for use by the phonological component" (65), and such rules ("readjustment rules") often have the effect of reducing structure. (66)

Once the readjustment rules have resolved sequences like past-stand, the string is ready for phonetic interpretation. Although the readjustment rules may have additional functions, their purpose as outlined above is sufficient for this discussion; they serve as a mediator between the transformational and phonological subcomponents of the grammar, preparing strings for phonetic interpretation. One might thus say that the phonological rules interpret the output of the readjustment rules. (67)
4. The Transformational-Contrastive Approach

This chapter attempts to show how English and German can be contrasted by the use of transformational descriptions of various aspects of the two languages. The rules chosen for this purpose in no way represent an attempt at a thorough statement of transformational processes at work in either language. As stated in the introduction to this paper, these rules were chosen for their appropriateness for demonstrating various similarities and differences between English and German.

Some rules show strong similarities between English and German with respect to the transformations themselves; these rules were chosen not only to show this similarity, but also because it was felt that a rule which was similar for both languages would better point up the differences to be found in other parts of the two grammars, e.g., differences between lexical components.

4.1. The Categorial Components of English and German

Categorial rules are presented for English and German in this section; although I feel that these rules are universal, I present them here only with reference to English and German. In essence, I am
claiming that rules like these will be found in a universal base. The rules presented here for the categorial component are mostly as sketched above (sections 3.1, and 3.3.), with a few changes and additions as indicated.

The first rule of the categorial component is:

\[
\text{PS-1. } S \rightarrow S-T + \#\text{Sent } 
\]

This is the same as the rule given in section 3.3., with the addition of the sentence boundaries $\$\$ and $\#$ (to open and close the sentence, respectively). Sentence boundary symbols (68) are added because they may be useful in the identification of items occurring in different positions in a string (69); to indicate an element which occurs in sentence-initial position or in sentence-final position, one may use $\$X$ and $X#$, respectively. These symbols also prove useful in the formulation of some transformations. They also have the general purpose of specifying the definition of "sentence." One could say that a sentence is whatever occurs between the symbols $\$\$ and $\$\$.$" Thus, the following strings all have the status of "sentence," in varying degrees of abstractness:
That is, a simple sentence (70) is a string of symbols beginning with ≠ and ending with ≠ and containing no instances of either. (71) In the categorial component, the symbols ≠ and ≠ will appear only in the first rule (cf. PS-1) and will flank an embedded S in any later rules; they must always appear in a derivation: they are never deleted or omitted in the categorial component.

PS-2 and PS-3 restate the rules given above (in 1, i-ii), except for the use of Sent for S:

PS-2. Sent → NP + VP
PS-3. VP → Aux + VG (Adv)

PS-2 merely states that any well-formed sentence consists of a subject and a predicate. (Actually, it would be more accurate to say that this rule asserts that every well-formed sentence has a subject and a predicate in its deep structure. The definitions of subject and predicate in 4, i-ii above would need to be rewritten as (NP, Sent) and (VP, Sent) in order to
be consistent with PS-2.)

The category VG is next rewritten in one of the more complex categorial rules; this rule is also quite important for the development of nominal constructions and the positioning of NPs in the deep structure:

\[
\text{PS-4.} \quad \begin{align*}
\text{VG} & \rightarrow \text{V} \left\{ \text{PNom} \right\} \\
& \quad \left\{ \text{(NP) (PrepP)...} \right\}
\end{align*}
\]

(72)

Rules PS-5 and PS-6 extend the description of NP positioning, and further indicate which categories have NP as an immediate constituent:

\[
\text{PS-5.} \quad \begin{align*}
\text{PNom} & \rightarrow \left\{ \text{Adj} \right\} \\
& \quad \left\{ \text{NP} \right\}
\end{align*}
\]

\[
\text{PS-6.} \quad \begin{align*}
\text{PrepP} & \rightarrow \text{Prep + NP}
\end{align*}
\]

The last rule presented here (73) is probably the most important, because it analyzes the category NP into its immediate constituents and provides the grammar with a recursive property by making one of those constituents the embedded sentence (≠S#):

\[
\text{PS-7.} \quad \begin{align*}
\text{NP} & \rightarrow \left\{ \text{Pro} \right\} \\
& \quad \left\{ \text{(pl) (≠S#)} \right\}
\end{align*}
\]

\[
\left\{ \text{Det + N} \right\}
\]
Note that the element pl is placed outside the braces, whereas the modification of (1,v) (cf. section 3.1.3., p. 24) includes pl within the braces. This element is placed outside the braces now, so that Pro will be allowed to co-occur with pl, allowing the subsequent formation of plural pronoun forms.

The most important facet of PS-7 is the presence of the optional (≠3#). This not only provides the recursive property necessary in a grammar, but is also the device which makes relative clauses possible, as well as other structures, like prenominal adjectives, noun phrase complements and verb phrase complements (74); it also provides a method of recognizing embedded sentences. If the element ≠S# is chosen in the rewriting of NP, this noun phrase will contain the deep structure basis for a relative clause (provided a noun phrase in the ≠S# is co-referential with the dominating NP). Such would be the case for sentences like (14), whose lexical structures (75) are as indicated in Figure 7-A and Figure 7-B:

(14) A. A hugh linebacker tackled the quarterback.
    B. We saw a sunset which was beautiful.
S
  S-T
  \+Sent#

\+NP
  Det N
  a
  linebacker

\+S#

Aux
past V
tackle

\+VP#

VG #
NP #
Det N #
the
quarterback #

\+a

is huge #

\+a

Figure 7-A
Figure 7-B

S

S-T

≠Sent

≠NP

≠Pro

pl

past

Aux

V

see

NP

≠S

Det

a

N

sunset

≠the sunset

was beautiful
If both Pro and S are chosen in the rewriting
og NP, sentences like (15) are possible, with the
corresponding lexical structures shown in Figure 8-A
and Figure 8-B:

(15) A. Bill knows that Jill will return.
    B. He thought that I was joking.

```
    S
      \       \  +Sent#
       \     \  +NP  VP#
        \   \+Bill       \
         \  \  Aux  VG#
          \  \  pres  \
           \  V   NP#
             \  know   \
              \  Pro   +S#
                \  it   \\##Jill will return##
```

Figure 8-A
Figure 8-B

Figure 7-A is also an example of the type of structure which is the basis for sentences in which a noun is modified by a preposed adjective. Figures 8-A and 8-B show structures from which "that-" clause modifiers are derived: all four of the structures above
are converted to their actual sentence form in the transformational subcomponent. The presence of (+S #) in PS-7 thus not only provides recursiveness, but also provides the basis for much of the variety possible among surface structures.

It should be pointed out that if, in any one derivation, VG is rewritten (by PS-4) as a string containing NP, and this same NP is, later in the derivation, rewritten (by PS-7) as a string containing both Pro and +S #, then this embedded sentence constitutes the deep structure basis of a verb phrase complement.

The boundary symbols flanking the embedded sentence in PS-7 deserve special notice. In deep structure derivations, a string which is rewritten from an embedded sentence is flanked by more than one pair of boundary symbols, e.g., #X....Y##; if this constituent sentence itself contains another embedded sentence, then that constituent sentence would be flanked by three pair of boundary symbols, etc., so that a constituent sentence always has one pair of boundary symbols more than its matrix sentence. In this manner, one can not only distinguish between matrix and constituent sentences, but one can also more easily determine which is the most deeply embedded S in a
structure. (Recall that it is the most deeply embedded S to which transformational rules first apply.)

Boundary symbols can also be useful in making the following definitions:

(16) A. A "simple sentence," abbreviated \( \neq X \ldots \neq Y \neq \), is a string which begins with structure-initial \( \neq X \) and which ends with structure-final \( Y \neq \), and which contains no occurrences of \( \neq /\neq \).

B. A "complex matrix," abbreviated \( (\ldots ) \neq X \ldots \neq /\neq \ldots Y \neq (\ldots ) \), is a string beginning with \( \neq X \) and ending with \( Y \neq \) which does contain (one or more) instances of \( \neq /\neq \). \( \neq X \) and \( Y \neq \) may or may not be structure-initial and structure-final. If they are, the string \( SY \) is a "highest complex matrix," abbreviated \( \neq X \ldots \neq /\neq \ldots Y \neq \); if \( \neq X \) and \( Y \neq \) are not structure-initial and structure-final, the initial and structure-final, the string \( XY \) is a "complex constituent," abbreviated \( \ldots \neq X \ldots \neq /\neq \ldots Y \neq \ldots \).

C. A "simple constituent," abbreviated \( \ldots \neq X \ldots Y \neq \ldots \), is a string beginning with non-structure-initial \( \neq X \) and ending with non-structure-final \( Y \neq \), and containing no occurrences of \( \neq /\neq \).

(It is customary to use \( \# \) as a boundary symbol at both beginning and end of a sentence. The advantage in using different symbols for beginning and end is that, given a string which contains an embedded sentence,
\[ A + B + C \neq D + E + F + G \neq \ H + I + J + K \]

there is no danger of considering the embedded sentence to be the string \( H + I + J + K \), whereas such a mistake would be possible with a string such as

\[ A + B + C + D + E + F + G \ H + I + J + K \]

Categorial rules P3-1 through PS-7 will generate the deep structure necessary for the development of most types of nominal constructions in English and German. The remainder of the development of constructions is carried out in the lexical component and transformational subcomponent of the two grammars. The transformational subcomponent, however, cannot operate until the strings have been processed by the lexical component.

4.2. Lexical Components

The function and structure of the lexical component was outlined in section 3.2. The present section characterizes lexical components for English and German.

Before any listings are presented, English and German may be contrasted with respect to the specification of gender for noun entries. The gender of a
German noun is unpredictable in most instances (76), and must be specified as an idiosyncratic (inherent) feature of each noun entry. In English, on the other hand, there is no "grammatical gender:" most English nouns are neuter; the designations \[+\text{masc}\], \[+\text{fem}\] are reserved for nouns which are also marked \[+\text{An}\] (77). Therefore, for English nouns, the following convention shall be followed in the lexical component: all entries marked as nouns (\[+\text{N},\ldots\]) are assigned the feature \[+\text{neut}\], unless they are already marked \[+\text{An}\] (78).

4.2.1. English Nouns

Sample lists of lexical entries may now be presented, first for English, and then for German.

English nouns are specified for category, syntactic features, and for morphological information; this latter specification indicates how each noun forms its plural. Each noun entry is specified for the application of a given rule in the phonological component. Nouns such as \textit{boy}, which form the plural by adding \textit{-s}, are specified for the application of the phonological rule which adds this suffix: \textit{boy}, \[+\text{N},\ldots, +\text{Rule Ph-1},\ldots\].

Nouns like \textit{goose} and \textit{mouse}, which form the plural by changing the stem vowel, are marked for the application of rules which effect this change. For
goose, which is marked \([+N,..., +\text{Rule Ph-2}]\), rule Ph-2 will change the stem vowel to \(\text{ee}\); for mouse and louse, marked \([+N,..., +\text{Rule Ph-3}]\), rule Ph-3 will change the stem vowel to \(\text{i}\). The change of \(\text{a}\) to \(\text{e}\), as in man - men, is effected by rule Ph-4. Nouns which add the suffix -en, like ox, acquire this suffix in phonological rule Ph-5; ox, and other nouns thus forming the plural, are therefore marked \([+N,..., +\text{Rule Ph-5}]\).

The phonological rules effecting these changes operate on the presence of the element \(+\text{pl}\) and the feature \([+\text{Rule Ph-X}]\) in the string. This information is specified in the SD of each such phonological rule, which deletes \(+\text{pl}\) and \([\text{Rule Ph-X}]\) in the operation of changing the form of the noun entry. Nouns like sheep and fish, which do not physically change to form the plural, will be subject to the application of rule Ph-6, which simply deletes the element \(+\text{pl}\) without making any change in the form of the entry.

It should be noted that this specification of rule application preserves idiosyncrasies in the lexicon. It would not be possible to predict changes for plural forms on the basis of singular forms. For example, mouse changes to mice, but house and spouse
do not change to *hice and *spice; ox changes to oxen, but box and fox do not change to *boxen and *foxen, etc. The listing of English nouns looks like this:

(1) \([+N, +Com, (+Ct), (An), +Hu]\) :
- boy, [+Rule Ph-1]
- child, [+Rule Ph-4]
- doctor, [+Rule Ph-1]
- girl, [+Rule Ph-1]
- librarian, [+Rule Ph-1]
- linguist, [+Rule Ph-1]
- mailman, [+Rule Ph-4]
- president, [+Rule Ph-1]
- soldier, [+Rule Ph-1] etc.

(2) \([+N, +Com, (Ct), +An, -Hu]\) :
- antelope, [+Rule Ph-1]
- bee, [+Rule Ph-1]
- deer, [+Rule Ph-6]
- dolphin, [+Rule Ph-1]
- goose, [+Rule Ph-2]
- horse, [+Rule Ph-1]
- mouse, [+Rule Ph-3]
- ox, [+Rule Ph-5]
- quail, [+Rule Ph-6]
- sparrow, [+Rule Ph-1] etc.

(3) \([+N, +Com, +Ct, (-An), +Abst]\) :
- ability, [+Rule Ph-1]
- belief, [+Rule Ph-1]
- degree, [+Rule Ph-1]
- failure, [+Rule Ph-1]
- idea, [+Rule Ph-1]
- mistake, [+Rule Ph-1]
- opinion, [+Rule Ph-1]
- sorrow, [+Rule Ph-1]
- talent, [+Rule Ph-1]
- victory, [+Rule Ph-1]
(4) \([+N, +Com, +Ct, (-An), -Abst]\):

automobile, [+Rule Ph-1]
blood, [+Rule Ph-1]
candle, [+Rule Ph-1]
flame, [+Rule Ph-1]
house, [+Rule Ph-1]
laboratory, [+Rule Ph-1]
pencil, [+Rule Ph-1]
toenail, [+Rule Ph-1]
tooth, [+Rule Ph-1]
wristwatch, [+Rule Ph-1] etc.

(5) \([+N, +Com, -Ct, +Abst]\) (80)

boredom
enthusiasm
fatigue
fidelity
information
intelligence
rest
sarcasm
sleep
stupidity

(6) \([+N, +Com, -Ct, -Abst]\)

air
blood
dirt
granite
light
sand
steel
water
wool
zinc
4.2.2. German Nouns

More information is given within the braces for German nouns than for English ones. German noun entries contain specifications for gender and for two types of morphological information. First, they are specified as being "strong" ([+str]), "weak" ([+wk]), or "mixed" ([+mx]); second, they are specified for the later application of phonological rules which yield plural forms.

The features [+str], [+wk], and [+mx] are used in
determining the inflectional endings for case. Rule PH-1 for German provides for those nouns which add the suffix -e to form the plural. Rule Ph-2 adds -n or -en; Ph-3 adds -er, and Ph-4 adds -s. (81) Rule Ph-5 deletes the element +pl for nouns whose plural form is phonetically identical to the singular form. One rule (Ph-6) treats those nouns which have an umlauted stem vowel in the plural (but not in the singular). This rule assures that the stem vowels a, o and u become å, ö, and ü, respectively. A noun like Mann, whose plural is formed by umlauting and suffixation, is thus specified for the application of two rules, namely Ph-3 and Ph-6.

Noun entries in the German lexicon would appear thus:

(1) \[ +N, +Com, ( +Ct), ( +An), +Hu \] :

<table>
<thead>
<tr>
<th>Noun</th>
<th>Gender</th>
<th>Number</th>
<th>Case</th>
<th>Rule Ph-1</th>
<th>Rule Ph-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arzt</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Bauer</td>
<td>+masc</td>
<td>+mx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chaperon</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Dichter</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Frau</td>
<td>+fem</td>
<td>+wk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koch</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Mann</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Mensch</td>
<td>+masc</td>
<td>+wk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rächer</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Schäfer</td>
<td>+masc</td>
<td>+str</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Tante</td>
<td>+fem</td>
<td>+wk</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(2) \[+N, +Com, (Ct), +An, -Hu]\n
Affe, [+masc, +wk]
Bär, [+masc, +wk]
Frosch, [+masc, +str, +Rule Ph-1, +Rule Ph-6]
Imme, [+fem, +wk]
Kater, [+masc, +str, +Rule Ph-5]
Lamm, [+neut, +str, +Rule Ph-1, +Rule Ph-6]
Pferd, [+neut, +str, +Rule Ph-1]
Ratte, [+fem, +wk]
Schwein, [+neut, +str, +Rule Ph-1]
Vogel, [+masc, +str, +Rule Ph-6] etc.

(3) \[+N, +Com, +Ct, (-An), +Abst]\n
Abkunft, [+fem, +str, +Rule Ph-1, +Rule Ph-6]
Blüte, [+fem, +wk]
Feier, [+fem, +wk]
Gefahr, [+fem, +wk]
Gestalt, [+fem, +wk]
Meinung, [+fem, +wk]
Natur, [+fem, +wk]
Reverenz, [+fem, +wk]
Sünde, [+fem, +wk]
Zeit, [+fem, +wk] etc.

(4) \[+N, +Com, +Ct, (-An), -Abst]\n
Baum, [+masc, +str, +Rule Ph-1, +Rule Ph-6]
Blatt, [+neut, +str, +Rule Ph-3, +Rule Ph-6]
Finger, [+masc, +str, +Rule Ph-5]
Kirche, [+fem, +wk]
Pflug, [+masc, +str, +Rule Ph-1, +Rule Ph-6]
Ring, [+masc, +str, +Rule Ph-1]
Stuhl, [+masc, +str, +Rule Ph-1, +Rule Ph-6]
Teller, [+masc, +str, +Rule Ph-5]
Wagen, [+masc, +str, +Rule Ph-5]
Wand, [+fem, +str, +Rule Ph-1, +Rule Ph-6]
Proper nouns are essentially the same in both English and German, but some proper nouns in German can have gender specification and can be [+str] or [+wk]:

(7) [ +N, -Com, (+An), +Hu ]:
    Ludwig
    Gretchen
    Brahms etc.

(8) [ +N, -Com, +An, -Hu ]:
    Bello
    Mitzi
    Jumbo etc.
The first matter is the specification of contextual features, which may be more or less specific. The less specific contextual features are stated by using the category NP to designate whether a verb may be, must be, or must not be transitive. More specific contextual features are in terms of syntactic features of the (correct) NP; for example, a verb such as like can co-occur with any type of object NP, while its subject NP must be animate, and verbs like feed require animate objects and are thus marked \([+V, \ldots +[+An], \ldots]\). (A feature specification is given for subject only if there is a restriction on the type of NP with which the verb can (grammatically) co-occur; for example, a verb which can co-occur with any type of subject NP is unmarked for subject, while one requiring an animate
subject is marked this: like, \([+V, \ldots [+\text{An}] +\ldots\ldots]\).

The second consideration regarding entries for verbs involves the difference between English and German with respect to inflection for case. (85) In English, only (Pro,NP) is inflected for case, and even then the inflection is much less extensive than in German. In English, the NP is in the nominative only if it is an (NP,S); if it is an (NP,Prep) or an (NP,VG), it is in the "objective case" (excluding cases such as "it is I," "it is he," etc.). (Case government features need not be specified for verb and preposition entries in the English lexicon; there is simply a convention which states that they all govern the "objective case.")

In German, however, inflection affects not only (Pro,NP), but also (Det,NP) and (N,NP), as well. And, in addition to the case \([+\text{nom}]\) (for (NP,S) and (NP,PNom)), there are three object cases: \([+\text{dat}]\), \([+\text{gen}]\), and \([+\text{acc}]\). Some verbs require that their object NP be in the \([+\text{dat}]\) case, some require the \([+\text{gen}]\), and others require the \([+\text{acc}]\) case for their object NP. These verbs are said to "govern" these cases. Similarly prepositions govern the oblique (not \([+\text{nom}]\) cases), in that the case of an (NP,PrepP) is determined by the case which the preposition governs.
Case features are assigned to an NP in the transformational subcomponent, but in order for such transformations to occur, certain information about case government must be supplied by the specification of case government features in the lexical entries for verbs and prepositions. The preposition aus, for example, governs the [+dat] case, while für governs the [+acc], and in governs either [+dat] or [+acc], thus (86):

\[
\text{aus, } [+\text{Prep},..., [+\text{dat}]] \ldots \]
\[
\text{für, } [+\text{Prep},..., [+\text{acc}]] \ldots \]
\[
\text{in, } [+\text{Prep},..., + \{\begin{array}{c}
\text{dat} \\
\text{acc}
\end{array}\}]] \ldots \]

Features for case government must also be given for verbs. Since most verbs govern the [+acc], one can state a convention for the lexicon of German such that a transitive verb governs the [+acc] unless otherwise specified. If no case government feature is given for a verb entry, its object NP must be in the [+acc] case. (Verbs which cannot take an object are, of course, not assigned a case government feature.) Such would be the situation of kaufen, lesen and sehen in the following examples:

\[
\text{antworten, } [+\text{V},..., [+\text{Hu}] + [+\text{Hu}] [+\text{dat}]] \ldots \]
\[
\text{bedürfen, } [+\text{V},..., +\text{NP} [+\text{gen}]] \ldots \]
As a result of this type of procedure, strings such as

\[
\text{\#Det - Herr+masc+wk - past+antworten - Det - Lehrer+masc+str+NPC-5 \#}
\]

reach the transformational subcomponent supplied with the information necessary for the declension of their NPs.

Designed as outlined here, the categorial and lexical components will provide most of the structures and idiosyncratic information necessary for the derivation of surface structures in the transformational subcomponent. (87)
4.3. Some Transformations

The purpose of this subsection is to compare and contrast some transformational operations in English and German. Operations have been chosen for their ability to bring out similarities and differences between the two languages, and are stated only as explicitly as this discussion requires. Some rules are stated more simply than others.

4.3.1. The Passive

Consider the following sentences:

(17) A. The dog bit the man.
    B. The man was bitten by the dog.

(18) A. Der Hund biss den Mann.
    B. Der Mann wurde von dem Hund gebissen.

Sentences like (17,B) and (18,B) are the result of the operation of an obligatory passive transformation. The underlying deep structures may both be represented by the same tree and labeled bracketing, as both sentences have the same structure (shown in Figure 9).
Figure 9
As previously mentioned, the presence of the element Pass in this structure triggers this obligatory passive transformation. The operation is quite similar for both languages, and is quite common in each.

The formulation of the rule for English, simply stated, is:

\[
\text{obl} \quad \text{Eng-T} \quad \text{SD: } \# \text{Pass} - \text{NP}_1 - \text{Aux} - V - \text{NP}_2 \#
\]

\[
\text{SC: } 1 \quad 2 \quad 3 \quad 4 \quad 5
\]

\[
\Rightarrow \quad 5 \ 3 \ \text{be} \ 4+\text{en} \ \text{by}+2
\]

This rule performs four individual operations simultaneously: first, it deletes the element Pass; second, it permutes NP\textsubscript{1} and NP\textsubscript{2}; third, it inserts be between Aux and V, and adds the suffix -en to V. (Other rules of the grammar provide for the conversion of Aux - be - V+en into, e.g., is being bitten, was bitten, had been bitten, etc. For verbs which form the past participle with -ed, e.g., play, edit, the suffix -ed would be used instead of the -en shown here.) Finally, it inserts a preposition (by) before NP\textsubscript{1}; this preposition indicates the agent or instrument ("logical subject") of the sentence.

The formulation of the rule for German uses the same structural description, and the structural change is quite similar:
This structural change also permutes the NPs, deletes Pass, inserts a preposition (von or durch) before NP\(_1\) to denote the "logical subject," and inserts werd after Aux. One should note the position of the main verb, however, relative to NP\(_1\). In English, the main verb (its past participle, bitten, in 17b) precedes by+NP\(_1\). In German, on the other hand, NP\(_1\) precedes the main verb, which is sentence-final. Another similarity between English and German passives can be seen when the agent of the sentence is represented by a pro-form:

(19) a. The book was written by him.

b. Das Buch wurde von ihm geschrieben.

The same operation has taken place as in (17b) and (18b), but in the sentences in (19), it is clearer that the agent in the English sentence is in the oblique ("objective") case; in (17), the agent still has the same phonological shape after the transformation has occurred, because only pronouns show case inflection (in English).
In German, there is a set of rules which provides the proper case markings for the NPs. This will place the agent of (18) in the dative case because it is the object of von (or in the accusative if durch is used) after the transformation has applied; similarly, the (pre-transformational) object is changed so that it is now dominated by S, and it will therefore be in the nominative case.

It should also be noted that the rules involved in case designation must necessarily follow the passive transformation, for the reasons just given. If case were assigned before the passive applied, (18b) would be *den Mann wurde von der Hund gebissen. Because the case of an NP is determined by what immediately dominates it, the passive transformation must apply before these rules of case designation.

4.3.2. Relative Clauses

Another transformation which demonstrates a remarkable similarity between English and German is that operation which is the source of relative clauses. With the exception of case marking and one point of word order, the two languages are identical in this operation.
Consider the following:

(20)  
  a. A mathematician who has a lot of money bought the estate.
  b. The mathematician knew a man who owned a hotel.

(21)  
  a. Ein Mathematiker, der viel Geld hat, kaufte die Besitzung.
  b. Der Mathematiker kannte einen Mann, der ein Hotel besass.

The sentences in (20) and (21) are transforms of the relative clause transformation, which is triggered by the presence of an embedded S. A condition on grammaticality is that a noun phrase in the embedded sentence be co-referential with the NP into which the sentence is embedded. If this condition is not met, the rule for relative clause formation will not function, and the result will be ungrammatical. Sentences (20a) and (21a) have a sentence embedded in the subject of the matrix sentence; in (20b) and (21b), a sentence is embedded in the object of the matrix. The structure of (20a) and (21a) is shown in Figure 10; the structure of (20b) and (21b) is shown in Figure 11.
Figure 10
Once again, the structural description is the same for both languages. The rule for English is formulated as follows:

\[
\text{obl} \\
\text{Eng-}T \\
\text{rel} \\
\text{SD: } \ldots \text{NP}_m \ldots Z - \text{NP}_c \ldots \\
\text{SC: } 1 \ 2 \ 3 \rightarrow 1 \ 2 \ \text{RP}
\]

conditions: (1) the matrix NP (NP\textsubscript{m}) and the constituent NP (NP\textsubscript{c}) are co-referential; NP\textsubscript{c} may not be immediately dominated by PNom.
(2) Z may be Prep or \(\emptyset\).

This formulation, of course, applies to other structures, beside those shown in Figure 10 and Figure 11. The structures shown in these Figures depict a sentence embedded into a subject NP, and a sentence embedded into the object of a verb. The rule just given also applies to sentences embedded into the object of a preposition.

In German, the word order of a relative clause is altered so that the main verb (of the embedded sentence) is shifted to the end of the clause. (90) For this
reason, it is necessary to give more information in the SD of the German rule, and to split the rule into two parts. The first part of the rule treats those cases where the co-referential NP is the subject of the embedded sentence. The second part treats the remaining cases. Since the verb must be shifted, Aux and V must be shown separate from X, where V + X is a VG; otherwise, the rule operates as in English:

\[
\text{obl Ger-T rel}
\]

(a) SD: \( NP_m \ldots \leftrightarrow NP_c - Aux - V - X \leftrightarrow \)

SC: \( 1 \ 2 \ 3 \ 4 \ 5 \)

\[\rightarrow 1 \text{RP} \ 5 \ 3 \ 4 \]

conditions: (1) \( V+X \) is a VG;
\( NP_m \) and \( NP_c \) are co-referential.

(b) SD: \( NP_m \ldots \leftrightarrow NP_2 - Aux - V - Z - NP_c \leftrightarrow \)

SC: \( 1 \ 2 \ 3 \ 4 \ 5 \ 6 \)

\[\rightarrow 1 \ 5 \text{RP} \ 2 \ 3 \ 4 \]

conditions: (1) \( NP_m \) and \( NP_c \) are co-referential; (2) \( Z \) may be Prep or \( \emptyset \); \( NP_c \) may not be immediately dominated by PNom.

The relative transformation is essentially a replacement of NP by a relative pronoun (RP); in English this RP will later combine with \([+Hu]\) to form "who," with \([[-Hu]]\ldots +\text{obj. case}]\) to form "whom," or with \([-Hu]\) to form "which." In German, RP will similarly combine
with features of gender, number (+pl) and case to yield the various forms of the relative pronoun.

As with the formulation for English, these rules for German treat other cases beside those shown in Figures 10 and 11. Some examples of the kinds of surface structures derived by these (German) rules are:

Ein Mann, der eine Wiese sieht,...
Eine Frau, die bei einem Schreibtisch stand,...
Ein Kind, das laut weint,...
Ein Bleistift, der gelb ist,...
Das ist der Junge, den ich traf.
Das ist der Mann, mit dem ich sprach.
Er sah die Frau, zu der ich das Geld gab.

The relative transformation may either precede or follow the rules of case designation, for this transformation does not change the information used as a basis for the designation of case. Since information about immediate domination is lost in permuting elements, it is necessary (in English) for the order to be as follows: (1) replace NP by RP; (2) assign case; (3) permute. (1) and (2) are ordered in English; in German, they may apply in either order, but both must precede (3).
4.3.3. Relative Clause Reduction

A sharper contrast between English and German is shown by the rule for reduction of relative clauses to prenominal modifiers, although there is still some similarity. Consider the following phrases:

(22) a. A good patient
    b. Eine dicke Dame

These phrases are transforms derived by a rule of relative clause reduction, which may be simply described as one which deletes some elements from a structure which is itself a transform of the rule $T_{rel}$, and permutes one other element. One condition for this rule is that the relative clause consist of (for English) the string $RP - Aux - V_{cop} - Adj$, or (for German) the string $RP - Adj - Aux - V_{cop}$. The rule of relative clause reduction deletes $RP$, $Aux$ and $V_{cop}$ and shifts $Adj$ to a position before the noun. Noun phrases like those in (22) can thus be traced back to structures with a sentence embedded into an NP:

* Det - patient - #Det patient is good## ...
* Det - Dame - #Det Dame ist dick## ...

This operation is optional in both languages and could be stated by two separate rules, one which first deletes $RP$, $Aux$ and $V_{cop}$, and another which then moves $Adj$ to its prenominal position; but since the shift of
the adjective is obligatory once these elements have been deleted, the whole operation can be stated in one rule. The rules for English and German can be stated thus:

\[
\text{opt Eng-T adj-shift} \quad \text{SD: } \begin{array}{c} \text{Det} - \text{N} \end{array} \begin{array}{c} \pm \pm \text{RP} - \text{Aux} \text{ } \text{V}_{\text{cop}} - \text{Adj} \end{array}\#\# \\
\text{SC: } 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \\
\quad \rightarrow \quad 1 \quad 7 \quad 2
\]

\[
\text{opt Ger-T adj-shift} \quad \text{SD: } \begin{array}{c} \text{Det} - \text{N} \end{array} \begin{array}{c} \pm \pm \text{RP} - \text{Adj} - \text{Aux} - \text{V}_{\text{cop}} \end{array}\#\# \\
\text{SC: } 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \\
\quad \rightarrow \quad 1 \quad 5 \quad 2
\]

To the extent that relative clause reduction has been presented so far, English and German are identical. But relative clause reduction has not been presented completely for either language yet, for, in both languages, relative clause reduction operates on other structures as well as on those given above. Consider these noun phrases:

(23) a. The setting sun
b. The man from Rome
c. In einem bei Jena liegenden Dorf (Kleist)
d. Ein Mann aus Rom
e. Ein laut bellender Hund
It is clear that the sequences $RP - Aux - V_{cop} - Adj$ (English) and $RP - Adj - Aux - V_{cop}$ (German) were never present in the history of any of the NPs in (23). The first two, a and b, were associated with sequences like

(24) a. $\#NP - \#\#NP - being - V\#\# - VP\#$
    $\#Det - sun - \#\#Det - sun - pres - being$
    $- set\#\# - VP\#$
    $\#The - sun - RP - is - setting\#$

b. $\#NP - \#\#NP - Aux - V - PrepP\#\# - VP\#$
    $\#Det - man - \#\#Det - man - pres - be$
    $- from - Rome\#\# - VP\#$
    $\#the - man - RP - is - from - Rome - VP\#$

The following rules can be used to derive sentences like (23a,b):

\begin{align*}
\text{opt} & \quad \text{Eng-T} & \quad \text{rel-red-1} \\
\text{SD:} & \quad \text{Det+N} - RP - Aux - be+V+ing \\
\text{SC:} & \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \\
\quad \quad \downarrow \quad \uparrow 1 \quad 6 \quad 2
\end{align*}

\begin{align*}
\text{opt} & \quad \text{Eng-T} & \quad \text{rel-red-2} \\
\text{SD:} & \quad NP - RP - Aux+V - PrepP \\
\text{SC:} & \quad 1 \quad 2 \quad 3 \quad 4 \\
\quad \quad \downarrow \quad \uparrow 1 \quad 4
\end{align*}

(It would also be necessary to restrict Prep so that the rule applies only to certain prepositions, like from, on, et al.)
Phrases like (23c,d), like (23b), have PrepP as one element in the deep structure, and (24e) is associated with a deep structure in which the string V - Adv is involved; phrase (23c) goes through various stages of development in the transformational subcomponent, as represented in (24c):

(24) c. ...PrepP...

...Prep - Det - N - # Det - N - Aux V - PrepP # # ... 
...Prep - Det - N - RP - PrepP - Aux - ...
...Prep - Det - PrepP - Aux - V - N...
(...in - Det - bei - Jena - Aux - liegen - Dorf...) 

The final line of (24c) contains a string of symbols which has the structure of the output of Ger-T°obl; close examination will reveal that the relative clause das bei Jena liegt is derived from a sentence embedded into the NP Det - Dorf, which is the object of the preposition in. A string having the structure of the output Ger-T°obl, and traceable back to that rule, can also be found in the final lines of (24d,e), which represent various stages in the transformational history of (23d,e):
A description of the output of Ger-\textsubscript{T\textsuperscript{obl}} can thus be used as an SD to state the rule which derives sentences such as (24c,d,e); the mechanism for the derivation of sentences like those in (22) and (23) is now given in its entirety. It consists of two parts. The first part (four rules) is used to derive sentences like (22a,b) and (23b,d); the second part (two rules) is used to derive sentences like (23a,c,e)

1 A. \text{Eng-T\textsuperscript{rel-red-1}}
\begin{align*}
\text{SD: } & \text{Det - N - RP - Aux - V} \quad \text{cop} - \left\{ \text{PrepP} \right\} \\
& \quad \left\{ \text{Adj} \right\} \\
\text{SC: } & 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \\
& \quad \rightarrow 1 \quad 2 \quad 6
\end{align*}

B. \text{Eng-T\textsuperscript{adj-shift}}
\begin{align*}
\text{SD: } & \text{Det - N - Adj} \\
\text{SC: } & 1 \quad 2 \quad 3 \quad \rightarrow 1 \quad 3 \quad 2
\end{align*}
Rules 1B and 1D demonstrate the similarity between English and German regarding pre-nominal adjectives. Also, note the contrast that, in English, the only prenominal modifiers are those derived by deleting \( \text{Aux} - V \) from the string \( \text{Aux} - V_{\text{cop}} - \text{Adj} \) and shifting the adjective; in English, prepositional phrases may stand as post-nominal modifiers only. On the other hand, prepositional phrase modifiers may occur pre-nominally in German, as long as the verb \( \text{Aux} + V \),
rather than being deleted, is also permuted, to a position between PrepP and N (and as long as later rules ensure that the string Aux - V in the output of Ger-T\textsuperscript{opt} \textsubscript{rel-red-2} will become kommend-, bellend-, etc.):

In einem bei Jena liegenden Dorf...

*In einem bei Jena Dorf...

It was previously stated (in section 4.3.2.) that relative clause formation and case marking are unordered with regard to each other. The question now arises as to the ordering of case marking in regard to relative clause reduction (and adjective shifting). Case marking is based on deep structure relations (immediate domination), as well as on syntactic features of lexical items. It is thus possible to mark the case of each NP before any transformations apply. It would then be vital that an NP retain the case assigned to it as subsequent transformations occur.

4.3.4. Case Designation and Inflection

nominative

In English, the assignment of the nominative case is handled by a convention which assigns the feature [+nom] to any \textit{(Pro,NP)} which is an immediate constituent of \textit{(NP,S)}. This convention deals with the item Pro only, because it is only pronouns which manifest case inflection
in English. In German, however, the string Det - N manifests case inflection as well as does Pro, so the convention for German must be stated thus: the feature [-nom] is assigned to the items (Pro,NP), Det and N if they are immediate constituents of (NP,S) or of (NP,PNom). (91)

oblique cases

The nominative case is assigned by conventions based on immediate domination by a grammatical category. The oblique cases are assigned by using co-occurrence relations. In English, there is only one oblique case (designated "obj.-case"), and it is assigned to any (Pro,NP) of this NP is immediately dominated by PrepP or by VG:

obl
Eng-T SD: X - Pro
case:D

SC: 1 2 \rightarrow 1 - 2+ \text{[obj.-case]}

conditions: (1) X is either Prep or V; (2) the NP which immediately dominates Pro is itself immediately dominated either by VG or by PrepP; (3) X and the NP immediately dominating Pro are both immediately dominated by the same node.

This states simply that a pronoun which is the object of a preposition or verb is in the object case. The
question of case in German refers to a much more extensive system. The rule for the assignment of the oblique cases in German may be stated as follows:

\[
\text{obl Ger-T case:D} \quad \text{SD:} \quad \{\text{Prep}\} - c - \{\text{V}\} - \{\text{Det + N}\}
\]

\[
\text{SC:} \quad 1 \quad 2
\]

\[
\rightarrow 1 - \left\{\begin{array}{c}
3 + 2 \\
4 + 2 - 5 + 2
\end{array}\right\}
\]

conditions: (1) \( c \) is \([+\text{gen}], \ [+\text{dat}], \) or \([+\text{acc}]\);

(2) \(1 \ 2 \ \left\{\begin{array}{c}
3 \\
4 \ 5
\end{array}\right\}\) is a PrepP

or a VG.

This rule will take a string like \(...)\text{folgen - dat - Pro...}\) as input, and permute the second the third items to yield the string \(...)\text{folgen - Pro - +dat...}, which ultimately (by other rules) would yield a string like \(...)\text{folgen...mir...}\) 

If item 1 of the above rule were represented by a preposition like \(\text{f¨ur}\), then the string \(...)\text{f¨ur - +acc - Det + N...}\) will become \(...)\text{f¨ur - [Det+acc] - [N+acc]...}, and the result would be a phrase such as \(\text{f¨ur den Knaben, f¨ur die Frau, etc.}\) (The \([+\text{acc}]\) following a strong or mixed noun will be realized as \(\emptyset\)). In the event that Prep is represented by one of the prepositions like \(\text{in}\) (i.e., one marked
[+Prep,... + \{\text{dat}_{\text{acc}}\}, \ldots], then the choice between [+dat] and [+acc] is based on the syntactic features of the verb (see footnote 86).

Gender is an inherent feature specified in the lexical entries of German nouns, and number is a category in the categorial component. Both gender and number are therefore already present and associated with the nouns in a terminal string as it enters the transformational subcomponent. Case features are copied in the rule given above; only one more rule is necessary to prepare simple noun phrases for phonetic representation. This rule copies the gender and number of a noun onto its determiner:

$$\text{Ger-T} \quad \text{SD: } [\text{Det} + \text{case}] + [N + \text{case} + \text{gender} + [+\text{pl}]]$$

$$\text{SC: } 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad \overset{\text{condition: } 2 = 4}{\longrightarrow} [1 \quad 2 \quad 5 \quad 6 \quad 3 \quad 4 \quad 5 \quad 6]$$

In this rule, "case" represents [+nom], [+gen], [+dat], [+acc]; "gender" represents [+masc], [+fem], or [+neut]. (The categorial component would generate either an instance of (+pl) or else no instance at all; no instance would be equivalent to [-pl].) A string like

$$[\text{Det} + \text{dat}] + [\text{Mann} + \text{masc} + [-\text{pl}] + \text{dat}]$$

would, by this rule, become

$$[\text{Det} + \text{dat} + \text{masc} + [-\text{pl}] + [\text{Mann} + [-\text{pl}] + \text{dat}]]$$
and this would ultimately become *dem Mann* (assuming, of course, that Det was rewritten as +Def).

This provides the mechanism for the declension of simple noun phrases, that is, noun phrases without modifiers. Noun phrases with modifiers require further rules.

There are two types of adjective inflection in German (commonly referred to as "strong" and "weak" inflection), and several factors determine which is used. Not only are the number, case and gender of the following noun important in this, but the preceding determiner also influences the inflection of an adjective. The rules which specify inflectional suffixes for determiners and adjectives are as complex as any other rules in the grammar of German. I suggest rules like the following for the assignment of inflectional suffixes. (92)

For DER-words, the following rules, D1-D5, convert various arrays of features into suffixes for the determiner ("D" in these rules indicates that the determiner is a "der-word"):

D1. SD: Det...- D - \{nom + masc\} + [-pl] - N (93)

SC: 1 2 3 4

\[\rightarrow 1+er 4\]
The rules converting arrays of features of EIN-words into suffixes would be like E1-E5:

\[
\begin{align*}
\text{E1. SD: Det... - E - } & \begin{cases} 
\text{nom} \\
\text{acc} \\
\text{masc} \\
\text{neut} \\
\text{fem} \\
\text{neut} \\
\text{masc} \\
\text{i} \\
\text{masc} \end{cases} + \begin{cases} [-pl] \end{cases} + N \\
\text{SC: 1 2 3 4} \end{align*}
\]

\[\Rightarrow 1+\emptyset 4\]
E2. SD: Det... - E - dat + {masc} + [-pl] + N

SC: 1 2 3 4

⇒ 1+em 4

E3. SD: Det... - E - {gen} + fem + [-pl] + N

SC: 1 2 3 4

⇒ 1+er 4

E4. SD: Det... - E - {nom} + fem + [-pl] + N

SC: 1 2 3 4

⇒ 1+e 4

E5. SD: Det... - E - acc + masc + [-pl] + N

SC: 1 2 3 4

⇒ 1+en 4

D1-D5 and E1-E5 do not account for masculine and neuter genitive nouns; these are accounted for by the next rule, which specifies the suffix for a genitive noun and for the preceding determiner:

Ger-Tobl SD: Det... +gen... - N + {str} + {masc} + {neut}

SC: 1 2 3 4

⇒ 1+es 3+es
It might be mentioned that it is not necessary to state features of number and gender in this rule; the way the rules are stated, a determiner can only have the features of number, gender and case which were copied in rules Ger-T\textsuperscript{obl} \textsubscript{case} and Ger-T\textsuperscript{obl} \textsubscript{det}.

The next two rules assign determiner suffixes when the element \([+pl]\) is present:

\[
\text{Ger-T\textsuperscript{obl}}_{pl-1} \quad \text{SD: Det} + \begin{cases} \text{nom} \\ \text{gen} \\ \text{dat} \\ \text{acc} \end{cases} \rightarrow 1 + \begin{cases} \text{-e} \\ \text{-er} \\ \text{-en} \\ \text{-e} \end{cases} 1
\]

(SC: 1 2 3)

(It may also be necessary to state special rules to ensure that the form \text{die} results when Det in this rule is represented by \text{d}-.)

The second rule could also be stated as a convention by which the determiner \text{ein} is marked \([-pl]\), so that the sequence \([\ldots \text{ein} + [-pl]] - [N\ldots + [+pl]]\) would automatically be ill-formed.

The inflection of an adjective in pre-nominal position depends upon: (1) the feature specifications for number,
gender, and case of the following noun, and (2) whether it is preceded by an inflected determiner (the form die is considered uninflected). The first rule, A1, gives the suffixes -e and -en to adjectives which are preceded by an inflected determiner. (This is the "weak" declension; Det+suff represents any inflected determiner):

A1.

SD: Det + suff - Adj - N - \{\text{nom}, \text{fem}, \text{neut}\} \{\text{acc}, \text{fem}, \text{neut}\}_3 + [-pl]

SC: 1 2 3 1 5

\[\Rightarrow 1 2 + \{e\} 3 5\]

The second rule for adjective inflection concerns strings which contain an adjective preceded either by no determiner, or by a determiner (EIN-word) with no (Ø) inflectional suffix. According to this, such strings are subjected to the operation of D1-D5, with the following modification of the rules: the first two terms of rules
D1-D5 (Det and D) are replaced by the terms \( \{ \emptyset \} \) and Adj. The SD of D1 is thus changed to

\[
A2. \ Det + \emptyset - \ Adj - \begin{cases} \text{nom + masc} \\ \text{gen} \\ \text{dat + fem} \end{cases} + [ -pl ] + N
\]

1 2 3 4

and the features given in term 3 correspond to the features of the noun in 4. The SC is then given as 1 2+er 4. This is done for all rules D1-D5.

Because D1-D5 do not account for masculine and neuter genitive noun phrases, the following rule is necessary. An adjective standing alone before a noun marked with the features +gen, + \{ \text{masc} \} and + [ -pl ] is given the suffix -en thus:

\[
A3. \ SD: \ \emptyset - \ Adj - N + \text{gen} + \begin{cases} \text{masc} \\ \text{neut} \end{cases} + [ -pl ]
\]

SC: 1 2 3 4

\[\Rightarrow 1+en 3\]

The rules for adjective inflection given so far are only for adjectives modifying singular nouns. The final
rules now give the suffixes for adjectives which modify plural nouns. A4 gives the "strong" declension, and A5 gives the "weak" declension:

\[
\begin{align*}
\text{A4. SD: } & \quad \{\varnothing\} - \text{Adj} - \ldots + \begin{cases} 
\text{nom} \\
\text{gen} \\
\text{dat} \\
\text{acc}
\end{cases} \ldots + [+pl] \ldots \\
\text{SC: } & \quad 1 \quad 2 \quad 3 \quad 4 \\
& \quad \begin{cases} 
\text{e} \\
\text{er} \\
\text{en} \\
\text{e}
\end{cases} \quad 4 \\
& \quad \rightarrow \quad 1 \quad 2+ \quad 3+ \quad 4 \\
\text{A5. SD: } & \quad \text{Det + suff} - \ldots - \text{Adj} - \ldots N + [+pl] \ldots \\
\text{SC: } & \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \\
& \quad \rightarrow \quad 1 \quad 3+ \quad 4+ \quad 5 \\
& \quad \text{condition: 2 and 4 contain } \varnothing, 1, \text{ or more Adj.}
\end{align*}
\]

It is quite obvious that English and German are almost totally different with respect to the extent of case inflection which they manifest. Because nouns, adjectives and determiners do not inflect in English, word order is much more important, and many stylistic (permutation) transformations are not possible in English, while they are perfectly acceptable in German:

Der Mann ass einen Apfel.
Einen Apfel ass der Mann.
The man ate an apple.
*An apple ate the man.
The difference in case inflection is probably the greatest difference to be found between English and German.

I have until now said very little about the genitive case, the nature and function of which is still under consideration; any analysis of the genitive must be regarded as quite tentative. Because of this situation, and because so little is presently known about the genitive, I shall only present a summary description of it here. I would like to point out, however, that many genitive constructions in both English and German seem to be related to constructions involving the verb *have/haben*. It may be that this entails only the possessive use of the genitive; at any rate, the two languages are nearly identical in this regard. Such noun phrases of possession seem always capable of being paraphrased by a construction with *have/haben*:

(25) A. My father has a house.
B. My father's house...
C. The lady has a car.
D. The lady's car...
E. The baker has an oven.
F. The baker's oven...
I would like to make the tentative suggestion that phrases such as (25, B) and (26, B, C,) are the result of a sentence being embedded into a noun phrase. A rule such as the following (applying to both languages) might offer a partial description of how some such phrases are derived:

\[
\text{TObl SD:} \# \text{NP}_1 \ldots \# \text{NP}_2 - \text{Aux+have} - \text{Det} + \text{N}_3 \# \# - \text{VP} \#
\]

\[
\begin{array}{cccccccccc}
\text{gen-} & \text{poss} \\
\text{SC:} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
\text{(A)} & \quad & \quad & \quad & \quad & \quad & \quad & \quad & \quad & \quad & \quad \\
\Rightarrow 1 & 2 & \text{of} & 4 & 9 & 10 & \Rightarrow 1 & 4+\text{gen} & 2 & 9 & 10 \\
\end{array}
\]

This rule has been written for English, but, with some minor modifications, could be made to work for German as well. The rule has two transforms because of the two kinds of possessive genitive which are possible:
The boy has a book.
#The book of the boy...
The boy's book...

The house has a roof.
The roof of the house...
The house's roof

Both kinds of possessive genitive are possible in German, but this is evidently not true of English. In German, any given string meeting the SD of this rule may become either transform; that is, the first transformation (A) is obligatory, and the second (B) is optional. But, in English, it seems that a given string meeting the SD of this rule may become only one of the transforms, and not the other. For the string paraphrased as the boy has a book, transformation (A) is obligatory, and so is transformation (B). But for the string paraphrased as the house has a roof, transformation (A) is obligatory, whereas transformation (B) must not apply.

There is probably more at work in English than the structure given in the SD of this rule. Whatever the final and complete solution turns out to be, it will probably include a rule much as the one given above; it might also be pointed out that this transformation will need to precede the rules which assign the suffixes of case inflection.
4.3.5. Pronouns

The final two transformations discussed in this chapter involve operations in which the two languages are quite similar or identical; the sections presenting them are therefore rather short.

Personal pronouns are almost identical in function for both English and German. The main difference is that these pronouns in English do not take the genitive form as a result of being dominated by certain verbs and prepositions, as is the case in German. Both languages would require their lexicons to list personal pronouns; such a listing for English might appear as follows:

\[
\begin{align*}
I, & \ [ +PP, \ldots +Ps \ - \ 1, \ldots ] \\
you, & \ [ +PP, \ldots +Ps \ - \ 2, \ldots ] \\
he, & \ [ +PP, \ldots +Ps \ - \ 3, \ldots +masc, \ldots ] \\
she, & \ [ +PP, \ldots +Ps \ - \ 3, \ldots +fem, \ldots ] \\
it, & \ [ +PP, \ldots +Ps \ - \ 3, \ldots +neut, \ldots ] \\
we, & \ [ +PP, \ldots +Ps \ - \ 1, \ldots +pl, \ldots ] \\
you, & \ [ +PP, \ldots +Ps \ - \ 2, \ldots +pl, \ldots ] \\
they, & \ [ +PP, \ldots +Ps \ - \ 3, \ldots +pl, \ldots ]
\end{align*}
\]

The listing for German would then be:
The shape of the pronoun to be used is determined by the function it has in the sentence (subject, object of a preposition, etc.), and by the number and gender of its antecedent NP (the NP with which it is co-referential). The following rules give the oblique-case forms of the pronouns listed above. For English:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Objective</th>
<th>Possessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>you (-[+pl])</td>
<td>[I]you</td>
<td>[me]you</td>
</tr>
<tr>
<td>he</td>
<td>[him]</td>
<td></td>
</tr>
<tr>
<td>she</td>
<td>[her]</td>
<td></td>
</tr>
<tr>
<td>it</td>
<td>[it]</td>
<td></td>
</tr>
<tr>
<td>we</td>
<td>[us]</td>
<td></td>
</tr>
<tr>
<td>you (+[+pl])</td>
<td>[you]</td>
<td></td>
</tr>
<tr>
<td>they</td>
<td>[them]</td>
<td></td>
</tr>
</tbody>
</table>

The shape of the pronoun to be used is determined by the function it has in the sentence (subject, object of a preposition, etc.), and by the number and gender of its antecedent NP (the NP with which it is co-referential).
The rule giving the genitive forms (when occurring pre-nominally) would be:

\[
\begin{align*}
&\text{I} \quad \text{my} \\
&\text{you} (-[+pl]) \quad \text{your} \\
&\{\text{he}\} \quad \{\text{his}\} \\
&\{\text{she}\} \quad \{\text{her}\} \\
&\{\text{it}\} \quad \{\text{its}\} \\
&\text{we} \quad \text{our} \\
&\text{you} (+[+pl]) \quad \text{your} \\
&\text{they} \quad \text{their}
\end{align*}
\]

As might be expected, the corresponding rule in German are more complex:

\[
\begin{align*}
&\text{ich} \quad \text{mein-} \\
&\text{du} \quad \text{dein-} \\
&\text{Sie (+polite)} \quad \text{Ihr-} \\
&\text{Ihr (+dialect)} \quad \text{Euer-} \\
&\{\text{er}\} \quad \{\text{sein-}\} \\
&\{\text{sie}\} \quad \{\text{ihr-}\} \\
&\{\text{es}\} \quad \{\text{sein-}\} \\
&\text{wir} \quad \text{unser-} \\
&\text{ihr} \quad \text{euer-} \\
&\text{Ihr} \quad \text{Euer-} \\
&\text{Sie} \quad \text{Ihr-} \\
&\text{sie} \quad \text{ihr-}
\end{align*}
\]
The rule for the development of the element 

\[ +\text{Pro}, ... +\text{Ps} - 3... \] 

depends in both languages on the existence of an antecedent (95) NP. The same rule will work for both English and German, because both languages are identical with regard to the process used for second-person pronouns (this rule should precede the rules just given and should also precede the process of case designation):

\[
T^\text{obl}_{\text{pro}} \quad \text{SD: } \neq ... \text{NP}_1 + X_1 + Y_1 + Z_1\# ... \hat{\text{Pro}}_1 ... + Z_2 ... \#
\]

\[
\text{SC: } 1 2 3 4 5 6
\]

\[
\Rightarrow 1+2+3+4 5+2+3+6
\]

conditions: (1) \(\hat{\text{Pro}}_1\) is marked \[ ... +\text{Ps-3...} \];
(2) \(\text{NP}_1\) and \(\hat{\text{Pro}}_1\) are co-referential;
(3) \(X_1\) and \(Y_1\) are features of number and gender; (4) \(Z_1\) and \(Z_2\) are features of case and may or may not represent the same case. (96)

Structures progress to sentences through stages as shown in (27):

(27) \[ \neq \text{Det} + N \left[ -\text{pl} \right] + \text{nom} - \text{Aux} + V - \]

\[ \text{Det} + N\# ... \neq \text{Pro} - \text{VP} \#
\]

\[ \neq \text{Det} + \text{Mann} + \text{nom} - \text{past+kaufen} - \]

\[ \text{Det} + \text{Wagen} \# ... \neq \text{Pro} - \text{VP} \#
\]

Der Mann kaufte den Wagen. Er (fuhr dann weg, etc.).
4.3.6 Preposition Deletion

Consider the following English and German sentences:

(28)  
A. I bought a book for my brother.  
B. I bought a book for him.  
C. I bought my brother a book.  
D. I bought him a book.

(29)  
A. Ich kaufte dem Kind einen Ball.  
B. Er gibt den Ball zu dem Jungen.  
C. Er gibt den Ball dem Jungen.  
D. Er gibt dem Jungen den Ball.  
E. Wir warten auf den Zug.

Sentences like those in (28) and (29) involve the choice of the optional element PrepP in the categorial component. Under certain conditions, the preposition of this PrepP may be deleted (cf. (29,c) above), and its object then permuted with the object of the main verb (cf. (29,d) above). Some verbs, like geben, are said to require two objects, one in the dative, and one in the accusative. I propose that such a verb acquires two surface structure objects as a result of a transformation which deletes a deep structure preposition.

It is, however, not always possible to delete a preposition:

Wir warten auf dem Zug.

*Wir warten den Zug.
Verbs like *warten* can take a prepositional phrase, but the preposition cannot afterward be deleted. With verbs like *schicken*, *geben*, the deletion of the preposition is optional; and with verbs like *kaufen*, such a deletion is obligatory. I therefore propose rules of preposition deletion for English and German; such rules might take the following form:

\[
\text{Eng-}T_{\text{prep-del}} \quad \text{SD: } \text{NP}_1 - \text{Aux} + \text{V} - \text{NP}_2 - \text{Prep} - \text{NP}_3
\]

\[
\text{SC: } 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad \rightarrow \quad 1 \quad 2 \quad 5 \quad 3
\]

It is necessary to permute \(\text{NP}_2\) and \(\text{NP}_3\) since a string such as *he gives the ball the boy* is ungrammatical.

The rule for preposition deletion is stated for German as follows:

\[
\text{Ger-}T_{\text{prep-del}} \quad \text{SD: } \text{NP}_1 - \text{Aux} + \text{V} - \text{NP}_2 - \text{Prep} - \text{NP}_3
\]

\[
\text{SC: } 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad \rightarrow \quad 1 \quad 2 \quad 3 \quad 5 \quad (97)
\]

It should be pointed out that these rules are not marked as either optional or obligatory. This will be handled in the lexical components, since the rule is optional for some verbs, obligatory for others, and impossible for still others. (I have found no cases in which preposition deletion is obligatory for English.)
The rule just given for preposition deletion in German has a sequel; this sequel is an optional permutation which can occur only when the object of the preposition is represented by Pro:

\[ \text{ich gab das Buch zu ihm.} \]
\[ *\text{ich gab das Buch ihm.} \]
\[ \text{ich gab ihm das Buch.} \]

The rule is formulated thus:

\[ \text{Ger-}T_{\text{obj}}^{\text{opt}} \text- \text{perm} \]
\[ \text{SD: NP}_1 - \text{Aux} + \text{V} - \text{NP}_2 - \text{Pro} \]
\[ \text{SC: 1 2 3 4 } \rightarrow 1 2 4 3 \]

The rules for preposition deletion must also precede the process of case assignment, or else the object of the preposition will be incorrectly marked after the preposition has been deleted.
5. The Transformational-Contrastive Approach in Typological Perspective

In the first section, contrastive analysis was discussed as a method by which one seeks out potential sources of interference in second-language learning. This method, as discussed there, consists essentially of identifying non-equivalences with respect to transformational rules, and the goal of this activity is the identification of potential trouble spots for language students. Contrastive analysis, however, can be used for other (non-pedagogical) purposes, some of which are:

1. The classification of languages (as analytical, synthetic, etc.).

2. The specification of genetic relationships among languages.

3. The description of influences of languages upon one another.

4. The description of historical change, i.e., the contrasting of two (or more) different stages in the history of a language.

5. The reconstruction of proto-languages.

6. The solution of problems in translation; this would include problems in machine translation.

Contrastive analysis for pedagogical purposes is but one manifestation of an activity of comparing two (or more) languages. Such activity is known as linguistic typology. (98) Prior to a typological investigation, one must assume a
theory of language (i.e., a theory of language design = grammar), and the languages involved must all be described in terms of the theory. The theory of language assumed will thus to some extent determine the nature (form) the typological study.

In addition to assuming a theory of language, one must also decide what to use as a standard of comparison. To date, the custom in contrastive analysis has been to use one of the languages involved in the analysis as a standard of comparison, and the express differences between languages in terms of deviation from this standard. If one chooses to do a contrastive analysis of English and German, for example, one may use English as a standard, and then describe the ways in which German differs from English (i.e., how German deviates from the chosen standard).

Although it has been customary to use one of the languages involved as a standard, there is an alternative. In Principles of Structural Typology, B. Uspensky proposes the construction of an étalon language (metalanguage) as a standard of comparison:

A concrete criterion for the valuation is necessary. The idea of invariance forms the basis of all linguistic comparisons (as well as of every comparison in general). We require an étalon language from which to proceed when typologically describing various languages. The étalon language is generally understood as an abstract language model which is used as a standard in typological comparison. On determining an étalon language and the rules of transformation from an étalon language to concrete languages under
examination, it is possible to obtain a consistent and uniform description of these languages. An étalon language can thus be regarded as a meta-language in relation to the described languages,... (99)

In other words, Uspensky is suggesting the construction of an abstract language with respect to which the languages involved are to be compared. In the following diagram, M is the metalanguage, X and Y are concrete (natural) languages:

\[ \begin{array}{c}
M \\
\downarrow \\
X \quad Y
\end{array} \]

One may arrive at a characterization of a language by comparing it to the standard of the metalanguage; MX is a characterization of language X's deviation from M. It is also possible, then to compare languages X and Y by stating the ways in which each varies from the standard of M; to contrast X and Y, one contrasts MX and MY.

Uspensky's proposal is quite analogous to the transformational-contrastive approach as outlined above. One could view the metalanguage as a kind of universal base (although Uspensky does not claim this explicitly); what Uspensky refers to as "rules of transformation from an étalon language to concrete languages" are then analogous to language-specific rule components (transformational subcomponents, lexical components, phonological and
semantic components); finally, the comparison of MX to MY would correspond to a comparison of transformational (or phonological, lexical, semantic) rules, as proposed here for the transformational-contrastive approach. Uspensky's proposal can thus be regarded as support for the universal base hypothesis and the transformational-contrastive approach.

As stated above, when a contrastive analysis of languages X and Y is carried out in the customary manner, X is taken as the standard (i.e., it serves as a metalanguage), the contrasts are stated from the point of view of the speakers of language X. This has the disadvantage of being unidirectional. It is of use to the speakers of language X, but it is not necessarily useful to the speakers of language Y: it may omit facts which are relevant for Y-speaking students of language X. When a universal standard (metalanguage or universal base) is used, however, the resulting contrastive analysis is bidirectional, of use to speakers of both languages.

Several possible uses of typological studies were listed above. Each may serve as a criterion by which one can evaluate a typological investigation. In my opinion, the transformational-contrastive approach, like Uspensky's proposal, lends itself to more of these goals than does the customary method of contrastive analysis. In support of the transformational-contrastive approach, then are
the following conclusions:

1. The advantages of greater (psychological, methodological, theoretical) explicitness ascribable to the theory of transformational grammar can also be ascribed to the transformational-contrastive approach.

2. The transformational-contrastive approach is bidirectional, and is thus of greater potential utility than the conventional type of contrastive analysis.

3. The transformational-contrastive approach operates with a universal base, and thus provides a more coherent and more consistent program for typological studies than has been offered in the past.
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Footnotes

1. Henceforth referred to as "transformational grammar."


3. More specifically, the discussion is within the framework of teaching German to speakers of (American) English.


5. For a brief outline of the problem, see also Kufner (1962), pp. 64-69.


7. Ibid., p. 283 (footnote).


10. Ibid., p. 41.


13. Ibid., p. 4.


15. Cf. the following passages from *Aspects of the Theory of Syntax*: "...linguistic theory may move toward explanatory adequacy and contribute to the study of human mental processes and intellectual capacity...." (p. 46) The theory of language represented by transformational generative grammar must "be regarded as a specific hypothesis, of an essentially rationalistic case, as to the nature of mental structures and processes."
   (See also the preface to Chomsky's *Cartesian Linguistics.* )
16. In section 3, I present a version of a transformational grammar which does not strictly adhere to this tripartite organization; since it is not relevant to the distinction between deep and surface grammar, I shall not discuss this difference here.


20. Earlier works in transformational grammar (e.g., Syntactic Structures) considered the rules to be a device for the generation of all the well-formed sentences of the language, and only the well-formed ones; it did not generate ill-formed sentences. A later view, expressed by Fillmore and others, and adopted here, is that ill-formed sentences can be generated by a grammar, but that they are marked as being ungrammatical.


22. For a brief and general discussion of this, see Seuren (1969), section 1.4.4., "Grammaticalness and deviance."


24. In Aspects of the Theory of Syntax, Chomsky refers to "transformational rules of the lexicon" (p. 122).

25. I do not feel that it is absolutely necessary to remove the lexicon from the syntactic component. Transferring it to the transformational subcomponent or making it a third subpart of the syntactic component might achieve the same effect just as well. I consider all three alternatives to be more or less equivalent. These other alternatives can be represented thus:
26. They are also called "non-terminal strings;" note here that my terminology differs somewhat from that of others, e.g., Chomsky, in that here deep structures are the input to the lexical component, whereas for Chomsky deep structures are the output of the base (i.e., after lexical substitution). What I call the base corresponds to what Chomsky refers to as the "categorial subcomponent."

27. Chomsky discusses this matter of the order of rewriting rules in Aspects pp. 67-68.


29. For example, while Katz and Postal (1964) question the extent to which base rules can be universal, their discussion is wholly in terms of the categorial component (see Katz and Postal (1964), pp. 158-159).

30. Not only are lexical entries different in nature from lexical and grammatical categories, but context-free subcategorization rules are also different from phrase structure rules, as Chomsky recognizes when he suggests assigning these subcategorization rules to the lexical subcomponent of the base. See Aspects, p. 121.

32. Ibid., pp. 117-118.

33. Ibid., p. 112.

34. The vocabulary used in writing phrase structure rules consists of formatives and category symbols. (Category symbols are the more abstract classes in deep structure: S, NP, VP, PrepP, etc.) Formatives are of two types: lexical and grammatical. "Lexical formatives" is synonymous with my term "lexical entries;" both terms refer to items listed in the lexicon (including nouns, verbs, determiners, prepositions, adjectives, pronouns and adverbs). "Grammatical formatives" are those items present in preterminal strings which are not later replaced by lexical substitution. These are items such as +past, +plural, syntactic features, etc. One might say that a terminal string consists of these two kinds of formatives, the grammatical formatives having their source in the base (categorial rules), and the lexical formatives originating in the lexicon and being introduced into the string through lexical substitution.


36. 1-4, see Chomsky (1965), p. 71.

37. Ibid., p. 123.

38. Other rules, and some modifications of these, not relevant to the discussion at this point, will be added to the base later, and shall be discussed at that time.

39. As is customary, the asterisk (*) indicates ill-formed (ungrammatical) strings or sentences.

40. If it should turn out that there are any languages in which pronouns are preceded by determiners, it would of course be necessary to reconsider this whole argument; a pronominalization transformation which includes the deletion of determiners might then be the best solution.

41. There might be a contextual or general theoretical condition that pro-forms for these categories (and perhaps for NP as well) may be realized in a sentence only if a previous sentence contains an instance of the co-referential phrase. For example, (81) would be ungrammatical unless preceded by a sentence such as "some men do nothing but argue all the time," and (8iiii)
would be possible as a response to "who dirtied all the dishes?", "someone broke the window," etc.

42. The issue of whether transformational rules alter meaning shall not be taken up in this paper. I shall assume that they either do not change meaning or that any change is so slight as to not be meaningful to my discussions. This is consistent with Chomsky's view as expressed in Aspects, p. 132.

43. By category representative, I mean a lexical entry, an actual word; e.g., "eat" is a category representative of V, "boy" is a category representative of N, etc.

44. Contextual features are not indicated for nouns; whether they are indicated for any categories other than for verb shall not be discussed here.

45. The following abbreviations shall be used from this point on: common: Com; count: Ct; animate: An; abstract: Abst; human: Hu.


47. Ibid., p. 82.

48. [___] here indicates the position of \( V_{\text{cop}} \) so that \([___]+[\_]\) is a VG.

49. The phonological information contained in a lexical entry shall not be specified here, since it is not germane; I give normal orthographical representations instead.

50. "The lexicon consists of an unordered set of entries and certain redundancy rules." (Chomsky (1965), p. 142.)

51. Whether any other categories are to have representatives in the lexical component is at present a moot point; at any rate, the question would be irrelevant here, for I shall use only N, V, Adj, and Prep.

52. If a lexicon is a part of a grammar which represents an idealized speaker-hearer's competence, and if a grammar also represents a system which the speaker-hearer has internalized, then one might look for psychological indications that the human mind tends to cluster words together in a fashion similar to
that presented here. I have found some evidence which
indicates that this is true. In an experiment
conducted by Fillenbaum and Jones (see Fillenbaum and
Jones (1965)), a word-association test was given to
406 subjects; there were 109 stimulus words from
various grammatical categories and the test results
showed that "for all grammatical categories (except
articles) the modal response class was the same as
that of the stimulus, but with considerable differences
of the popularity of the modal response class." (p. 248)
There is thus reason to believe that words are clustered
together in the mind according to grammatical category.

There is also reason to believe that this clustering
is dynamic, establishing itself more and more firmly
with age (presumably, as the grammar becomes internalized
to a greater and greater extent). This seems to be
borne out in a study by Entwisle (1966). In this
experiment, over 1,000 children (in kindergarten, first,
third and fifth grades) and 200 college students were
given a word-association test. One of the conclusions
of this study is that "word associations of young
children... show a pattern of development from unrelated,
to syntagmatic, to paradigmatic over this age range
[kindergarten to fifth grade].... Changes are related
to form class of a stimulus word, verbs and adjectives
developing more slowly than other classes...." (p. 558)
Entwisle also presents the following table, showing
this development:

<table>
<thead>
<tr>
<th></th>
<th>Kindergarten</th>
<th>1st gr.</th>
<th>3rd gr.</th>
<th>5th gr.</th>
<th>5th gr.</th>
<th>college</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nouns</td>
<td>61.2</td>
<td>62.7</td>
<td>72.9</td>
<td>78.1</td>
<td>81.0</td>
<td>77.1</td>
</tr>
<tr>
<td>Adjs</td>
<td>16.8</td>
<td>31.7</td>
<td>70.6</td>
<td>78.5</td>
<td>55.6</td>
<td>65.8</td>
</tr>
<tr>
<td>Verbs</td>
<td>16.6</td>
<td>70.4</td>
<td>47.5</td>
<td>59.6</td>
<td>56.1</td>
<td>60.0</td>
</tr>
<tr>
<td>Adverbs</td>
<td>8.6</td>
<td>17.9</td>
<td>51.2</td>
<td>62.1</td>
<td>57.5</td>
<td>78.9</td>
</tr>
<tr>
<td>Pronouns</td>
<td>16.5</td>
<td>29.8</td>
<td>65.4</td>
<td>65.2</td>
<td>60.0</td>
<td>78.0</td>
</tr>
</tbody>
</table>

In view of this data, I feel that such studies indicate
support for the grouping of lexical entries according
to categorial features. My presentation also proposes
the arranging of the entries in subgroups according
to contextual and syntactic features; I have found no syntactic or psychological motivation for this arrangement, and to this extent my suggestion is purely speculative. On the other hand, it works just as well syntactically, and seems to fit the pattern established by the arrangement of entries according to grammatical class.


54. Ibid., p. 84; further, in (D,C), "D is a phonological distinctive feature matrix 'spelling' a certain lexical formative and C is a collection of specified syntactic features."


57. The exact nature of the marking is not important to this discussion; the best would probably be some symbol like $\square$, $\boldsymbol{X}$, etc., placed somewhere within the string. Such a symbol would, by convention, be exempt from deletion unless whatever rule deletes it also corrects the mistake in the terminal string, etc. The presence of such a symbol (distinct from $\ast$) would help to distinguish between two types of deviant sentences: 1) those whose unacceptability derives from a conflict of syntactic or other features, and 2) those whose ungrammaticality derives from a misapplication of a transformational rule.

58. "Structural description" and "SD" are synonymous with "structural analysis" and "structural index."

59. There is more than one style used in the written form of transformational rules, but all have the same effect. I have chosen to adopt the style used by John Robert Ross in Constraints on Variables in Syntax (1967).

60. In Aspects (p. 87), Chomsky uses this method for indicating which verbs may be either transitive or intransitive, whereas I indicate them by using the feature $[\ldots \pm \_NP \ldots]$. I feel that these are equivalent alternatives, although the use of the feature $[\ldots \pm \_NP \ldots]$ does eliminate the need for the optional transformational rule proposed by Chomsky. The use of such a feature as opposed to such a rule indicates another divergence between the model presented here and that presented in
Aspects. By using this optional object-deletion rule, Chomsky means to indicate that the two sentences

(1) the boy is eating his lunch.
and (2) the boy is eating.

have the same underlying structure. By using the feature $[\ldots + \_NP \ldots]$ for the verb eat, I mean to indicate that sentences (1) and (2) have different underlying structures, and that the difference between them lies in whether the optional NP in rule (liii) is chosen in the rewriting of VG; if it is chosen, sentence (1) is the result, and if it is not chosen, (2) is the result.

61. As mentioned above, a transformational rule applies only to strings fitting a specified structural description. If a given string does not meet the SD of any obligatory transformations, then this string is said to be blocked in the transformational subcomponent. Since it then cannot become the surface structure of any well-formed sentence, such a string does not qualify as a deep structure, since, as pointed out in chapter 2 above, "the basic notion defined by a transformational grammar is: deep structure $M_d$ underlies well-formed surface structure $M_s$" (Chomsky (1965), p. 138). In that the transformational rules allow only certain strings (phrase markers) to qualify as deep structures, the transformational subcomponent is said to act as a "filter": any would-be deep structure is blocked in the transformational subcomponent if the transformational rules cannot convert it into a (well-formed) surface structure. For a more extensive discussion of this filtering effect, see Chomsky (1965), pp. 137-139.


63. Orthographic representations are used throughout this paper in place of phonological spellings.

64. Such a subcomponent can also be placed as the final stage of the transformational subcomponent, and this may in fact be the best location, since these rules, as is discussed below, share with transformational rules the characteristic of reducing structure. (Chomsky and Halle, in the Sound Pattern of English, treat the readjustment rules as a final stage of the
syntactic component— in fact, they speak of what they call the "readjustment component" (p. 236)."

An equivalent solution would be to include the readjustment rules as a subcomponent of the phonological component, preceding phonological rules.


66. Ibid., p. 10.

67. Ibid., p. 145.

68. Other boundary symbols, e.g., for word boundary, morpheme boundary, etc., shall not be taken up here. The symbol # is often used by others for both sentence and word boundary (e.g., Katz and Postal (1964)). The symbols + and # are purely idiosyncratic to this discussion and indicate sentence boundary only.


70. The term "simple" is used here to indicate a sentence containing no embedded sentences. As will be seen below, a sentence which contains an embedded sentence also contains instances of + and #, and will be referred to as "complex."


72. See Chomsky (1965), p. 107. "Predicate" in Chomsky's rule is equivalent to PNom in my rule PS-5, i.e., it dominates the categories Adj and NP ("predicate noun"). I have not allowed for the generation of the sequence V + Predicate, as Chomsky has; such a sequence may be possible in other languages, but it is not possible in English or in German. Chomsky's category "Predicate" is rewritten as

\[ \{ \text{Adjective} \} \{ (\text{like}) \text{Predicate-Nominal} \] 

For one thing, the sequence V - Adjective is not possible if the category V excludes copula verbs (V_cop), which Chomsky apparently feels to be the case.

It should be noted that the formulation of this rule must in many cases be regarded as only tentative until data from a sufficient number and variety of languages has been taken into account. It is very possible and perhaps even probable that the
formulation in PS-4 is not universal.

73. There would of course be many other rules in the categorial component. For example, Aux could be rewritten as immediately dominating Tense, Modal, etc. S-T can be rewritten as immediately dominating (Ø), (Q), (Neg), (Pass), etc.; the choice of Ø would result in a declarative sentence, Q would yield a question, etc. PS-7 is also the only rule containing the constituent Pro, even though it was pointed out that other categories (V, Adj, Adv) may dominate a constituent Pro; Pro is shown here for NP only because pro-forms for other categories are not discussed.

74. Since the distinction is not important here, I consider adjectival complements to be a subset of verb phrase complements and refer to them as verb phrase complements; adjectival complements are always constructed with copula verbs, and are thus always dominated by VG, as are other verb phrase complements.

75. The structures shown in Figures 7-A, 7-B, 8-A and 8-B are not lexical structures in the strict sense of the term, since Pro has been replaced and embedded sentences have been written out as if transformational rules had already been applied. Since I have no particular designation for such strings, and since these factors in the examples given are beside the point, I have called them "lexical structures" for lack of a better name.

76. Nouns which are derived, e.g., die Abhängigkeit (<adj<xverb), die Abkürzung (<verb<adj), die Einführung (<verb), die Freundschaft (<noun), etc., are predictable regarding gender, I shall not deal with derivational processes here (see Aspects, pp. 184-193). I shall, however, assume that the complete transformational grammars of both English and German do not contain transformational rules for deriving nouns, verbs, etc. I also assume that a transformational rule which would derive nouns (for German) would also assign a gender feature to derived nouns. I shall not take up the issue of whether derived items are to be listed as lexical entries; I have stocked the sample lexical components here with (mostly) non-derived entries, but I do not exclude the possibility that lexical entries are to be made for derived items as well.
77. This is a moot point. It seems that the speakers of (American) English are not in total agreement when it comes to referring to animals as "it", "he," or "she." Thus, for some (perhaps most) speakers, only [+Hu] nouns can be non-neuter, while for other speakers the class of non-neuters is as broad as the class [+An]. My decision to extend non-neuter status to the whole class of animate nouns is arbitrary.

78. The gender of animate nouns in English is either semantically predictable, e.g. "man", "woman", or else remains unspecified, e.g., "teacher", "librarian". In the former case, the assignment of gender is dependent upon knowledge of semantic information. One must know what a given noun refers to before one can know the gender of that noun. Such information is provided by the semantic component. This means that the relationship between the lexical component and the semantic component is not such that information is passed in one direction only, from the former to the latter. Some information must be allowed to pass from the semantic component to the lexical component, in this case information regarding the sex of an animate object. A revision of the diagram in Figure 1 might thus be necessary, perhaps an arrow leading from the semantic component to the lexical component. Such a revision would be further motivated by instances where well-formedness depends upon two noun phrases being co-referential (see section 4.3.2.). If the sex of an animate object remains unspecified, then gender is either unimportant, We have a good teacher or else context-dependent (also involving semantic information): Our teacher is an old lady. She is...

Gender, therefore, need not be specified by features in lexical entries (for English nouns) since it is in all cases predictable (directly, or indirectly by context) from semantic information.

79. The precedent was established earlier in this paper that phonological spellings shall not be used; all spellings here are orthographical. The features enclosed in parentheses are redundant (as pointed out in section 3.2.1.) and actually need not be listed; they are given here only for clarity.
80. Classes 5-10 are all classes of nouns which (grammatically) have no plural form. A rule in the transformational subcomponent will specify that only Pro and nouns marked $[+N,... +Com, +Ct]$ can co-occur with $[+pl]$. Entries in classes 5-10 therefore have no specification for the later application of phonological plural-forming rules. One could follow a convention that, if a plural is formed for an entry in one of these classes, that it would be marked for the application of rule Ph-1.

81. Nouns of this class are mostly borrowed from other languages, e.g., die Detail, der Boykott. Some foreign words form the plural in other ways, e.g.,

der Kultus-die Kulte;
a separate class would be necessary for these words in a full lexicon.

82. Since all weak and mixed nouns form the plural by adding -en/-n, a convention for German will state that all nouns which are $[+wk]$ or $[+mx]$ are marked for the application of rule Ph-2; it would therefore be unnecessary to give this marking in each such entry.

83. Like other entries, this word has both an abstract and a concrete sense, and would be listed also as $[+N, +Com, +Ct, -Abst]$. 

84. As in the English lexicon, groups 5-10 are nouns which have no plural form, and these are therefore not marked for the application of plural-forming rules. A convention for German would state that only nouns marked $[^+Com, +Ct]$ can co-occur with $[+pl]$. If a plural is formed for one of these German nouns, it would be marked for the application of rule Ph-2. Note also that feminine nouns which cannot form plurals are also not specified as either $[+str]$ or $[+wk]$, for the only difference in declension between $[+fem, +wk]$ and $[+fem, +str]$ nouns lies in the plural forms; the singular declension is the same for both.

85. The matter of case government is discussed further in section 4.3.

86. It may be possible to choose between $[+dat]$ and $[+acc]$ on the basis of syntactic features assigned to the verb with which the prepositional phrase co-occurs. One might, for example, assign the feature $[... +X+dat...]$
to the verb stehen, so that it will choose the
dative case for the NP in a following PrepP, when
the preposition is one like in, unter, auf, etc.:

...stehen in dem Zimmer...
*...stehen in das Zimmer...
...sitzen unter dem Baum....
*...sitzen unter den Baum....

There would, however, still be the problem of
verbs like tanzen, where the semantic content
would seem to be the deciding factor:

...tanzen in dem Zimmer...
...tanzen in das Zimmer..

Case government features are specified for both
prepositions and verbs. There are six instances in
which the selection of case for an NP is unambiguous,
i.e., when there is only one possible case which can
be (grammatically) assigned to the NP:

1. the verb requires (governs) the genitive
2. the verb requires the dative
3. the verb requires the accusative
4. the preposition requires the genitive
5. the preposition requires the dative
6. the preposition requires the accusative.

There is, however, one instance in which the
selection of case is ambiguous, i.e., one must
choose between two possible cases, either of which
is grammatical:

7. the verb indicates either the location or
the direction of movement of the NP, and
the preposition is one of that set of nine
(an, auf, hinter, in, neben, über, unter,
vor, zwischen) which governs either the
dative or the accusative.

If the NP is dominated only by VG or only by PrepP,
then the NP is assigned the case as specified in the
lexical entry for the verb or preposition at hand. If
the preposition is not one of these nine, then the
case assigned to the NP is determined solely by the
case-government feature of that preposition. The
ambiguity described above in (7) may be resolved as
follows. Each of these nine prepositions is marked as
governing either the dative or the accusative case.
Verbs like sitzen, stehen, etc., which indicate
location only are marked in the lexicon with the feature [...+loc...]. Other verbs, like laufen, tanzen, etc., can indicate either location (Tanzen in dem Zimmer) or direction (tanzen in das Zimmer). Each such verb is entered in the lexicon two times: one entry specifies the verb as [...+loc...], and the other specifies it as [...+dir...]. Then, if a verb entry marked [...+loc] is chosen, a condition on well-formedness states that the preposition (if it is one of these nine) must choose [...+dat] for its object NP; similarly, if the verb entry chosen is marked [...+dir], then the preposition must choose [...+acc] for its object NP.

In sum, the case assigned to an NP is determined by the case-government feature of a preposition; if this preposition is marked in the lexicon as governing either the dative or the accusative case, the choice of case is determined by the marking of the verb entry as [...+loc] or [...+dir]. A condition on well-formedness states that the combination of [...+loc] with [...+acc], or of [...+dir] with [...+dat] is ungrammatical.

Complete information is not supplied by the categorial component presented here. One example of an issue not treated here involves the analysis of the element Det, which might be rewritten thus:

\[
\text{Det} \rightarrow \begin{cases} 
\{\text{Prearticle} \} \\
\{\text{Def} \text{Demonst}\} \\
\{-\text{Definite}\}
\end{cases}
\]

Later rules in the transformational subcomponent and phonological component might take a string like +Def+Mann...+str---+gen... and ultimately convert it to des Mannes, etc.

Constructions like es wurde getanzt are here not considered to be passive constructions. It should also be pointed out that sentences like das Haus/es wurde gebaut are the result of the application not only of the passive transformation, but also of a rule for the deletion of the (deep structure) subject. Das Haus wurde von Paul gebaut thus becomes das Haus wurde gebaut. The "logical subject" of the sentence remains unspecified in the surface structure in such sentences.
89. The rule does not require that the sentence be a declarative one.

90. Not everyone agrees on the deep structure location of the verb in German. Moulton (1966b), for example, takes a position consonant with my position here. Bach, on the other hand, argues for the location of the verb at the end of the clause in deep structures (see Bach, 1962). This controversy, however, is just an outgrowth of a larger and more general disagreement concerning the classification of languages as 'SVO' (subject-verb-object) languages or as 'VSO' languages.

According to the typical transformational approach, if two or more structures are transformationally related, then one either takes one of the occurring forms as basic and derives the others from it by transformation, or else one posits a non-occurring form as deep structure and derives the occurring forms from it. English has long been considered an SVO language, but McCawley (1970) has presented arguments, some quite convincing, that English is actually a VSO language, and that SVC ordering is transformationally derived. His arguments are based on the simplification of formulation of transformational rules in English. All of his arguments deal with linear order of deep structure constituents. As long as one speaks of the grammar of only one language, with no reference to a universal base, questions of linear ordering of constituents can be decided using simplicity as a criterion. But if a universal base is assumed, an impasse is reached when it is asserted that the order XYZ is universal. This may simplify the description of language A, but it may also complicate that of language B. Conversely, asserting that the order YXZ is universal may simplify the grammar of language B while complicating that of language A. In such a case, the two orders would be equivalent. (It is not in itself necessarily undesirable, however, for a solution to simplify the grammar of one while complicating the grammar of the other.)

The issue is still being debated, and I know of no solution at present. I might suggest that, in a universal base, some (all?) categories be rewritten so that immediate constituents are indicated, but not in a fixed order. One could then say that neither VSO nor SVO is universal, but that S is rewritten thus:
where the wavy lines indicate that the material contained between them is linearly unordered. Order could then be specified in the transformational subcomponent of each language. Other categories would be treated similarly, e.g.,

\[
\begin{align*}
\text{PrepP} & \rightarrow \{ \text{NP, Prep} \} \\
\text{NP} & \rightarrow \{ \text{N, Det} \} \\
\text{etc}
\end{align*}
\]

to accommodate languages in which prepositional phrases occur (in surface structure) in the sequence article-noun-preposition, or languages in which noun phrases occur in the sequence noun-article.

This would amount to an admission that a universal base defines grammatical relations obtaining between grammatical categories, but does not specify any linear order of constituents. The surface structure order of constituents would be represented as idiosyncratic to each language.

Chomsky (1965; pp. 124-126) discusses and rejects such "set systems" and his refutation of them is quite persuasive. But note that his considerations in this matter are exclusive of the universal base hypothesis. I feel that the assumption of the universal base hypothesis might very well make a difference in evaluating such set systems. If one does assume a universal base, Chomsky's argument for linear ordering might also be supported by arguments of naturalness. Once criteria are established for distinguishing various degrees of simplicity, one says that simplicity and naturalness are in direct proportion to each other. One then predicts that the most natural phenomena will also be the most frequent phenomena. For more discussion of naturalness, see Zwichy, 1968.

91. The transformational subcomponent of German contains a rule for the deletion of an indefinite article before a predicate noun:

*er ist ein Student \( \rightarrow \) er ist Student
*er ist ein Arzt \( \rightarrow \) er ist Arzt.

92. These rules represent only one alternative; others are of course possible.

93. Lexical entries for Det are marked as being Der-words
( [+Det,... +D...] ) or Ein-words ( [+Det,... +E ]).

94. The features for person and for status as familiar, polite or dialectal are inherent to each personal pronoun; features for number and gender are copied, by a transformational rule, from the antecedent noun. It would appear that this particular type of lexical substitution would occur after the transformational rule which copies features from an antecedent noun.

95. This is nothing more than a co-referential NP appearing earlier. It may or may not be in the same sentence as Pro.

96. Rules for reflexive pronouns are quite similar to the rules for personal pronouns. In addition to differences in phonetic shape, the only differences are in the conditions. First, Pro₁ must be immediately dominated by VG (not by NP or PrepP); NP₁ must be immediately dominated by the Sent of the same S; finally, NP₁ and Pro₁ must be constituents of the same Sent.

97. It may be necessary to place restrictions on this rule, for example, that only prepositions governing the dative may be deleted (and perhaps not even all of these). In the case of geben it is automatic, since a PrepP following geben must contain zu; this holds true for other verbs also, like schicken, and is also the case in English, e.g., send, give, direct, etc. A dummy preposition governing the dative might be necessary for verbs like kaufen, which never occur with a PrepP in a sentence because preposition deletion is obligatory for them.

In English Transformational Grammar, Jacobs and Rosenbaum indicate difficulties in the analysis of prepositions and prepositional phrases. They view prepositions as deep structure features of "noun segments" and suggest that prepositions themselves are introduced by transformation. On the other hand, they admit that this view must allow for (transformational) deletion of prepositions, and they also allow for the existence of prepositional phrases in deep structures:

There is no very good reason to argue that constituents such as "of the city" [in "Jones approves of the city"] are anything but special constituents which we call prepositional phrases. On the other hand, grammarians do not, at the present time, have an understanding of the way in which prepositional phrases are generated from deep structures. (p. 141)
I can only view this statement as support for the inclusion of PrepP in the base. The following remarks by Jacobs and Rosenbaum are seen here as offering further support for my treatment of PrepP as a deep structure category: "...a preposition and its following noun phrase do not function like noun phrases but rather like special constituents identified as prepositional phrases.... Prepositions often do not appear in the deep structure of sentences because they have been deleted by either the subject or the object preposition deletion transformations." (p. 141)

Jacobs and Rosenbaum (p. 138) consider sentences like

The tournament is on Monday
*The tournament is at Monday
The tournament is at noon
*The tournament is in noon
Rusk flew to Bombay
*Rusk approved to Bombay
Rusk approved of Bombay
*Rusk flew of Bombay

and suggest that the grammaticality of these strings can be explained if it is assumed that the prepositions "on," "at," "in," "to," and "of" are uniquely associated with certain nouns and verbs. I think that this solution is at present the best available; it is also consonant with my proposal and presentation of a transformational grammar here. Selectional restrictions to associate these prepositions with given nouns and verbs can be stated in the lexicon, in a manner much the same as statements which restrict verbs to subjects which are [+Hu], objects which are [+An], etc.

98. The term "typology" has customarily been used to indicate contrastive analysis with the goal of classifying languages by type: synthetic, analytical, etc. The terms "typology," "typological study" and "typological investigation" are used here to refer to all contrastive studies, regardless of intended application. The term "contrastive analysis" shall be used to indicate typological studies having pedagogical application as a specific intended goal.

99. Uspensky (1968), p. 27. It should be noted that Uspensky does not intend the term "structural typology" to imply a connection with the "structuralist school" in linguistics. The term refers to the typology of structures, hence the name.
I might also point out that Uspensky does not claim to be the first to advocate the use of a metalanguage in typology. But, as he points out, in previous typological studies,....

the typological classifications were usually more or less oriented toward a certain hypothetical norm, i.e., a certain implicitly assumed language. This language, however, was not overtly postulated. This accounts to a great extent for the inefficiencies of these classifications. The employment of a metalanguage in indispensable in comparative analysis, it has always been used, though implicitly and vaguely. (pp. 27-28)