TRANSFORMATIONS AND DISCOURSE ANALYSIS PAPERS

University of Pennsylvania

80.

Tense, Aspect, and Conjunction:

Some Inter-relations for English

Richard I. Kittredge

1970
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>I. Introduction</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Framework and Context of the Study</td>
<td>1</td>
</tr>
<tr>
<td>B. Goals and Methodology</td>
<td>4</td>
</tr>
<tr>
<td>II. The Single Tense Hypothesis</td>
<td>7</td>
</tr>
<tr>
<td>A. The Hypothesis Stated</td>
<td>7</td>
</tr>
<tr>
<td>B. The Tense Pattern of Acceptable $S_1C_tS_2$</td>
<td>8</td>
</tr>
<tr>
<td>C. Support For the Tense Hypothesis</td>
<td>11</td>
</tr>
<tr>
<td>D. Patterns in the Occurrences of Some Tense Forms</td>
<td>17</td>
</tr>
<tr>
<td>E. Restrictions Viewed as Co-Occurrence Restrictions on $C_t$</td>
<td>20</td>
</tr>
<tr>
<td>F. Some Consequences of the Single Tense Hypothesis</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. Aspect and the Description of Time Conjunctions</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Aspect in Polish</td>
<td>31</td>
</tr>
<tr>
<td>B. The Use of Aspect in English</td>
<td>35</td>
</tr>
<tr>
<td>C. Aspectual Restrictions of the Domain of Conjunction by $C_t$</td>
<td>40</td>
</tr>
<tr>
<td>1. before and after</td>
<td>41</td>
</tr>
<tr>
<td>2. until</td>
<td>45</td>
</tr>
<tr>
<td>3. since</td>
<td>51</td>
</tr>
<tr>
<td>4. while</td>
<td>54</td>
</tr>
<tr>
<td>5. as</td>
<td>58</td>
</tr>
<tr>
<td>6. when</td>
<td>59</td>
</tr>
<tr>
<td>7. multiple usages: until after, since before</td>
<td>61</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (continued)

IV. Verb Operators and Aspect .......................... 63
   A. The Function of Verb Operators .................. 63
   B. Unrestricted Perfectivizing Operators .......... 65
      (begin, start, stop, etc.)
   C. Unrestricted Imperfectivizing Operators ...... 67
      (continue, keep, etc.)
   D. Negation ....................................... 68
   E. Restricted Perfectivizing Operators .......... 71

V. Prepositional Operators ............................ 76
   A. Prepositions as traces of Perfectivizing Operations 76
   B. Characterizing VP ............................... 84
   C. Some Comments on *VP .......................... 85
   D. Imperative and Negative Imperative on Aspectual Operators 87
   E. Possible Operator Sources for VP ............... 88

VI. Tense, Aspect, and Adverbial Time Expressions .... 91
   A. Types of Adverbial Time Expressions .......... 91
   B. Redundancy and Apposition in Modifying $S_1 C_t S_2$ .... 94
   C. General Present Tense with $C_t$ ................. 95

VII. Special Problems with t(have) Ven and t(be) Ving Operations .... 97

VIII. Interaction of $S_1 C_t S_2$ with Performatives .... 101
TABLE OF CONTENTS (continued)

A. Imperatives .............................................. 101
B. Questions .............................................. 103

IX. Relative Position of $C_t$ in Ordering of Transformsations .......................... 107
   A. $C_t$ Viewed as Binary Operator .................. 107
   B. $C_t$ Viewed as Unary Operator .................. 108
   C. Operators Which May Act On $C_t$ ............... 109
   D. Operators Which May Precede $C_t$ ............. 110

X. Summary and Implications ............................. 113
I. Introduction

A. Framework and context of the study

During the present stage of inquiry in transformational grammar an increasing number of linguists are finding it necessary to undertake detailed descriptive studies in order to test certain proposed generative grammars and to suggest the types of revision necessary when the rules of these grammars fail to account for regularities of structure.

The partial study of English structure presented here is an attempt to contribute to the description of verb tense and the other features of grammatical structure which seem to be most closely related to tense, among them conjunctions of time (e.g., before, until), operators on verbs (e.g., begin, Ving), and adverbial expressions of time (e.g., at 6 p.m., for three hours). Since these tense-related phenomena interact ultimately with a great many features of a formalized grammar, the description cannot be neatly presented nor can it be complete. But by considering the problem of co-occurrence in the environment of certain time conjunctions, the contributions of individual elements in the structural description can be made clearer. These co-occurrence data are particularly useful in determining the order of transformational operations in a generative theory of sentence structure.
The organization of the following chapters is closely related to the chronology of the investigation. The initial aim was to specify as compactly as possible the structural form of two sentences $S_1, S_2$ conjoinable by one of the subordinating time conjunctions $C_t$ (i.e., before, after, until, while, as, when, and the anomalous since). Using the framework of a transformational system of operators described in the next section, it was possible to show that a primary condition for conjoinability by a $C_t$ is that both $S_1$ and $S_2$ have the same tense morpheme (past, present, or future) for their main verbs. In order to support this claim it is necessary to show how in some cases the trace of sentence operators or zeroings on the conjoined $S_1 C_t S_2$ has obscured the existing tense conformity (see chapter II for details).

In addition to the tense restriction there is a complex set of additional restrictions illustrated by the following set of possible and impossible $S_1 C_t S_2$:

- John left before Mary arrived.
- *John left before Mary didn't arrive.
- Fred ran until he reached the road.
- *Fred started running until he reached the road.
- *The bomb exploded until the police arrived.
- John shook the rug until it was clean.
- *John shook out the rug until it was clean.

Normally, the expression of these restrictions in terms of existing transformational constructs (e.g., word classes and operators) would be lengthy and relatively unrevealing. It turns out, however,
that by introducing a construct called aspect \(^1\) which can be defined tentatively in terms of co-occurrences of certain structures of the type for three hours, at 6 p.m., the description of these conjoined sentences is considerably simplified. Chapter III deals with this construct and its use in specifying the occurrences of sentences with \(C_t\). Chapter IV illustrates how verb operators affect the aspect of the resultant verbal phrases, and chapter V likewise compares the effect of certain prepositional occurrences viewed as operators. Chapter VI adds more detail to the consideration of adverb-like phrases in conjoined sentences with the resulting conjecture for \(S_1C_tS_2\) as "adverb-sharing" constructions. Some residual problems involved in specifying the co-occurring \(S_1, S_2\) in \(S_1C_tS_2\) sentences consist largely of stating the occurrences of t(be) Ving and t(have) Ven. Some of these problems are discussed in chapter VII. Finally, the string properties of \(S_1, S_2\) are important in the treatment of performatives (questions and imperative constructions) (chapter VIII) and in the general problem of ordering of transformations (chapter IX).

The result of these individual sections is a small set of conditions necessary for the acceptable conjunction of two sentences by a \(C_t\). Although the form of these conditions is immediately applicable to the formulation of an operator system which characterizes language such as Harris' system, the data are relevant for any English grammar.

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\(^1\)The term has been used for English before (e.g., by Martin Joos).

B. Goals and methodology

The main problem of syntactic description is to show which strings of morphs co-occur as sentences of normal acceptability and what changes in individual morphs bring about systematic reductions in acceptability. In practice a number of rules and sub-categories are used as constructs so that revealing formalizations may be carried out. For the problem of time expressions the descriptive question can be taken as follows: which selections from the morpheme classes called verb, tense, auxiliary, adverb of time, and time conjunction can co-occur in acceptable sentences and how can the description be simplified by modifying the sub-categorization of morphemes and morpheme strings or by taking new constructs (e.g., transformations or similar relations between sentences).

Although grammatical transformations have been used to simplify the description problem (and in fact make description theoretically possible), the choice of transformational rules is particularly complex and unclear for verbal strings. For this reason, the description of time expressions presented here will avoid using more than the established operators. Thus the choice of operators for tense and aspect

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3 For a discussion of acceptability and transformation as well as the factorization of transformations into operators see Harris, op. cit., in particular pp. 51-84.

4 For the term time expression and a general discussion of tense and time in English, see Otto Jespersen, Essentials of English Grammar, (republished by University of Alabama Press, 1964).
representation is largely left open.

The approach to linguistic material taken by this study assumes the methods and many of the results of Harris as presented in *Mathematical Structures of Language*\(^5\). In particular it assumes that there is an abstract system capable of characterizing the set of sentences of a language and that each sentence (or rather each paraphrastic reading of each sentence) is characterizable as a sequence of operations on a finite elementary set of assertions.

In an important sense this work is an attempt to add linguistic detail to this system in such a way that a decision can be made as to the most efficient way of representing verbal constructions.

The form of the data for this investigation will be the relative acceptability of sentences containing certain time expressions. In addition to asking, for example, whether John began reading the book until Mary returned is or is not an acceptable sentence of English, we will also often ask whether John read the book until Mary returned is more acceptable. In many cases speakers react with sufficient uniformity so that we may mark the sentence with * (non-occurring), with ? (normal only in unusual environment), or with ✓ or ✓ or no mark (for normal acceptability). For a range of reactions, the limits of the range are juxtaposed (?* for questionable to unacceptable, (?) for normal to questionable).

\(^5\)Harris, op. cit.
In addition, considerable use will be made of the paraphrases of a given sentence in determining the distribution and class membership of various structures. The use of paraphrase in grammatical studies has been treated in detail elsewhere.  

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II. The Single Tense Hypothesis

A. The Hypothesis Stated

Let $C_t$ be a member of the class of subordinating time conjunctions which contains at least the members before, after, until, while, as, and when (also, marginally, since). Let past be the name of the verb suffix morpheme which acts as a classifier of all expressions like in the past, yesterday, one day last week, etc. Let present be the name of the verb suffix morpheme which acts as a classifier of all expressions like at present, now, at the moment, etc. Let future be the name of the morpheme which appears before the verb and acts as a classifier of all expressions such as in the future, next year, in three hours, etc. The future morpheme can be described as containing one phonetically zero form. Let tense be the name of the morpheme class containing exactly the past, present, and future morphemes. Then if $S_1CtS_2$ is an acceptable sentence of English and $S_1$ and $S_2$ both have the form of sentences, then the main verbs of $S_1$ and $S_2$ occur with the same tense morphemes.

When $S_1$ has a future morpheme and the form of $S_2$ is such that the tense morpheme is ambiguously present or zero-future, it can be shown that the sentence $S_2$ contains a zero future tense morph which is recoverable (for the purposes of description) on

\footnote{This view of tense-affixes as classifiers of particular sentence operators is discussed in Harris, op. cit., p. 174.}
the basis of the \( C_t \) and the tense morpheme in \( S_1 \). The traces of
the verb operators \( t(\text{have}) \ldots -\text{en} \) and \( t(\text{be}) \ldots -\text{ing} \) are not classified
here as tense forms but are shown rather to be partly conditioned
by the particular \( C_t \) as well as the particular operand verb. In some
cases (e.g., the \( \text{had} \ldots -\text{en} \) form) this conditioning may take the
form of co-occurrence with a zeroed \( C_t \). In such cases the recovery
of the \( C_t \) may be accompanied by the elimination of the operator,
leading toward a regularization of the text in which the \( S_1 C_t S_2 \)
appears.

B. The Tense Pattern of Acceptable \( S_1 C_t S_2 \)

Support for the hypothesis stated in the preceding section
comes from several sources: consideration of existing tense com-
binations in \( S_1 C_t S_2 \) from a large sample, consideration of various
nominalized forms for paraphrases of \( S_1 C_t S_2 \), and the interpret-
ability of the phonetic reduction of the second occurrence of the
future tense morpheme in sentences conjoined by \( C_t \).

The analysis of occurring tense pairs was carried out using
representative test sentences in each of twelve "tense forms"\(^2\)

\(^2\) Let us use the term tense (see p. 2) for the name of a class of
morphemes whose necessity is dictated by the form of the transform-
atational description. In particular, the existence of adverbial phrases
like in the future, tomorrow parallel to in the past, yesterday make
it desirable to take future as a morpheme of the same status as past
despite its unusual allomorphic distribution.
listed by traditional grammarians (e.g., eat: present perfect —
have eaten, etc.). Passive forms have been omitted since they
do not seem to add anything to the analysis. For each of the \( C_t \)
an evaluation of the acceptability has been reached for each of the
12 \( \times \) 12 = 144 tense form combinations. Seven charts (pp. 23-29)
give the results for each of the seven \( C_t \) under consideration here\(^4\).

It is striking to note that only a small percentage of the combinatorial
possibilities have an occurrence as an acceptable sentence. The
choice of other test sentences does not raise this percentage or change
its distribution significantly.

As might be expected, the "logically inconsistent" combinations
(e.g., John will leave before he ate breakfast) are rated as non-
occuring (with exceptions which prove to result from the trace of
a subsequent sentence operator on a regular form — see section VII.
A.). But the significant fact is that many logically consistent com-
binations do not occur where the verb of one \( S \) has a "past", "past
perfect", "past progressive", or "past perfect progressive" tense
form and the other \( S \) has a verbal construction in one of the corre-
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\(^3\) See Jespersen, op. cit., for example.

\(^4\) Other \( C_t \) such as now that were omitted because of tense dissimi-
larities and different transformational behavior generally.
ponding future or present tense forms. For example, we do not have the logically consistent *John ate breakfast before he will leave or *John ate breakfast before he is leaving or *John ate breakfast before he leaves. As it turns out, with the recovery of the zeroed future tense morpheme in the "present used as future" phenomenon described below, tense forms of $S_1$ and $S_2$ never differ by more than the operators have...-en, be...-ing. It is this fact that makes the single tense hypothesis possible.

Temporal since exhibits a deviation from this rule. If it were not for the highly restricted occurrence of since, this would be a serious threat to the hypothesis. The fact that (temporal) since does not occur with future tense forms in contrast to the other $C_t$ suggests that the transformational behavior of since is anomalous. In fact, in the vast majority of cases, since seems to occur with the "present perfect" (i.e., have...-en) form in $S_1$ and the "past" form for $S_2$. Sections III.C.3. and VII.A. present additional detail on the properties of since.

We may make a preliminary check at this point to see whether the acceptability of highly deviant sentences can be improved by

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5 Temporal since can be distinguished from causal since, often a synonym of because, by the fact that the latter does not have $S_1$ since $(S_2)_n$ as a paraphrase of $S_1$ since $S_2$. Here, as throughout the remaining discussion, the subscripted $(S)_n$ stands for the nominalization of the sentence $S$ (e.g., when $S$ is John drank milk $(S)_n$ is John's drinking of milk).
"adjusting" the tenses so that they conform. Consider the following pairs of deviant sentences:

* John bought a bottle of wine before five is a positive integer.
? John bought a bottle of wine before five was a positive integer.

* Cats love fish until the bomb exploded.
? Cats loved fish until the bomb exploded.

It turns out that the acceptability of the sentence in which the tenses of $S_1$ and $S_2$ are the same is in general no less than (and often is greater than) the acceptability of the corresponding sentence in which the tenses differ.

C. Support for the Tense Hypothesis

In order to test the tense hypothesis by using the charts on pp. 23-29, the proper correlation between tense forms and tenses must be made. On each axis, the first four tense forms contain the future tense morpheme will explicitly and hence each resulting $S_i$ ($i=1,2$) contains a future tense morpheme. The fifth through eighth forms are given in the form of present tense and hence in the conjoined sentence for which the acceptability decision is made, the occurrence may be as the zero form of a future tense morpheme (cf. comes in John will eat before Mary comes) as can be confirmed by testing certain paraphrases or questions for appropriate response (e.g., When will Mary come?) or some such device. The present tense morpheme is present if the addition of some classified adverb (e.g., now) is acceptable or appropriate. The last four forms on each axis of each
chart represent verb phrases containing the past tense morpheme which is expressed explicitly and uniquely for each verb.

By using the charts given here and constructing similar ones for other test sentences it is possible to verify with increasing confidence the proposed hypothesis about conformity of tense morphemes. In actual practice this comes about by showing how the occasional sentences which deviate from this pattern can be differentiated structurally from other $S_1C_tS_2$ sentences on the grounds of a phonemic stress on some segment or by a paraphrase which reveals that a zeroable sentence operator acts on the resultant of the $C_t$ operation. For example, on p. 25 we have the deviant John has waited until Mary arrived which is read with stress on has and is paraphrasable by It has on occasion happened that John waited until Mary arrived. There are grounds, therefore, for saying that the sentence $S_1C_tS_2$ is actually John waited until Mary arrived (which fits the tense hypothesis) and that has plus stress is the resultant of zeroing of the operator it has (on occasion) happened that. In general, the deviant sentences are few and seem to require some disruption of the normal unstressed sentence pattern. 6

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6This suggests that normal sentence intonation may be the resultant of an operation following a single tense operation and that conjoined sentences with because, and, but, etc. may differ in their intonation patterns because of the possibility of carrying two tense morphemes independently.
The absence of any $S_1 C_t S_2$ which contain two obviously differing tense morphemes for the main verbs of $S_1$ and $S_2$ respectively constitutes the first indication that there is a conformity or dependency between the tense morphemes. Additional confirmation for this view comes from considering paraphrases of $S_1 C_t S_2$ which have one or both of the $S$ replaced by the corresponding $S_n$. In particular, each of the $C_t$ under consideration has a corresponding $P_t$ (for most $C_t$, $P_t$ has the same form as $C_t$, but the $P_t$ for while is during) such that $S_1 P_t(S_2)_n$, $(S_1)_n V_c C_t S_2$, and $(S_1)_n V_c P_t(S_2)_n$ are all paraphrases of $S_1 C_t S_2$. The new $V_c$ brought in with two of the paraphrases is one of a small class of container verbs (e.g., occur) or a replacer such as t(be). Because a nominalized sentence cannot carry a tense morpheme two of the nominalizing paraphrase forms have only one verb which can carry the tense morpheme(s) of the $S_1 C_t S_2$ form.

If there were fewer paraphrastic readings of the nominalized forms with one verb than of the full $S_1 C_t S_2$ forms with two verbs, then this might be an indication that the two tense morphemes of $S_1 C_t S_2$ are independent. This does not seem to be the case. There do not seem to be any $S_1 C_t S_2$ forms which are not paraphrasable by one of the nominalized forms using one finite verb. Let us illustrate this with one example for each of the seven $C_t$:

(1) John left before Mary arrived.
John left before Mary's arrival.
John's leaving occurred before Mary arrived.
John's leaving occurred before Mary's arrival.
(2) Max will eat dinner after the sun has set.
   Max will eat dinner after the sun's having set.
   'Max's eating of dinner will be after the sun has set.
   Max's eating of dinner will be after the sun's having set.

(3) John watched the ship until it disappeared.
    John watched the ship until its disappearance.
    John's watching of the ship continued until it disappeared.
    John's watching of the ship continued until its disappearance.

(4) John has been chewing gum since he returned from Mexico.
    John had been chewing gum since his return from Mexico.
    John's chewing of gum has been going on since he returned from Mexico.
    John's chewing of gum has been going on since his return from Mexico.

(5) He will wait while you retrieve the ball.
    He will wait during your retrieving of the ball.
    His waiting will occur while you retrieve the ball.
    His waiting will continue during your retrieving of the ball.

(6) I saw the fire as I was leaving.
    I saw the fire upon my leaving.
    My seeing of the fire was as I was leaving.
    My seeing of the fire was upon my leaving.

(7) Fido came when Sam called him.
    Fido came at Sam's calling him.
    Fido's coming occurred when Sam called him.
    Fido's coming occurred at Sam's calling him.

The fact that nominalizations preserve the essential meaning
preserved in any paraphrase while obliterating tenses (and perhaps
shifting the tenses to other carriers) indicates strongly that only one
tense specification is really necessary in a sentence with a \( C_t \). It is also interesting to note that in many cases the operator traces of \( t(\text{have}) \ldots -\text{en} \) and \( t(\text{be}) \ldots -\text{ing} \) remain in the nominalization after the past, present, or future tense morpheme has been zeroed or shifted to another carrier.

A third kind of support for the single tense hypothesis comes from a closer look at the reduction of repeated future tense morpheme in \( S_2 \). To show that, for example, \( \text{John will eat before Mary comes} \) actually does contain a phonetically zeroed future tense morpheme in \( S_2 \), we have argued on the basis of appropriate tests of consequences or paraphrases. Consider now the paraphrases with nominalizations for sentences (2) and (5) above. Certainly if \( S_1(\text{future})C_tS_2(\text{present}) \) and \( S_1(\text{future})C_tS_2(\text{future}) \) both existed and had different meanings, there would be an ambiguity in the corresponding paraphrases where the \( S_2 \) is nominalized. This does not seem to occur, i.e., from the nominalized form one normally uses the present form for \( S_2 \) in giving the full paraphrase for sentences like (2) and (5). Moreover, there does not seem to be any difference in meaning (in terms of paraphrases given by native speakers) for the form with two future forms to the extent that it is accepted.

If the occurrence of present form in \( S_2 \) following future form in \( S_1 \) actually is the resultant of a zeroing operation on the phonetic
content of a future tense morpheme, why then is the unzeroed
\( S_1(\text{future})C_t S_2(\text{future}) \) usually less acceptable? The situation
seems somewhat analogous to that of pronouning:

? The man in the gray hat returned home before the man in the
gray hat went out to the party.

The man in the gray hat returned home before he went out to
the party.

? John will eat before Mary will arrive.

John will eat before Mary arrives.

It seems that tense-zeroing, like pronouning, is virtually obligatory when
it is recoverable\(^8\) on the basis of the environment and when the
resulting sentence is shorter. It is significant that for cases where
the predicate construction is the same for \( S_2 \) as for \( S_1 \), the unzeroed
form seems as good as the zeroed. They are also paraphrases:

John will see that film before you will see that film.
John will see that film before you will.
John will see that film before you do.

For the last sentence with zeroing of future tense morpheme, the
zeroed form does not give a resultant shorter than the partially zeroed form
since the insertion of do is automatic for sentential \( S_2 \). The fact that
there should be a difference in the acceptabilities of the forms which
is dependent on only the identity of the predicates indicates that the

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\(^8\)For a discussion of recoverability see Harris, op. cit., p. 67.
difference between the forms is only phonetic.

D. Patterns in the occurrences of some tense forms

Some general statements can be made after a survey of the data on tense form pairs. Aside from the conformity of tense described above, the occurrence of the \text{t(be)}\ldots\text{-ing} and the \text{t(have)}\ldots\text{-en} operators seems to be limited by some general restrictions:

1. The operator \text{t(be)}\ldots\text{-ing} does not occur in \text{S}_2 following \underline{before}, \underline{after}, \underline{until}, or \underline{since}.

For the large majority of examples, this statement holds.

Certainly, we do not have:

\begin{itemize}
  \item \text{*John left before Mary was arriving.}
  \item \text{*They watched the ship until it was disappearing.}
  \item \text{*He'll call them after they are returning.}
  \item \text{*He hadn't seen his brother since he was getting married.}
\end{itemize}

It is necessary, however, to describe two kinds of exceptions to this statement. First, there are cases where \text{t(be)}\ldots\text{-ing} is a replacer for \underline{t(begin)}\ldots\underline{ing} or some similar operator:

\begin{itemize}
  \item John kept playing poker until he was winning. \\
  \hspace{1em} (\text{cf.:} \hspace{1em} \text{John kept playing poker until he began winning.})

  \item Sam was practicing law before Max was practicing medicine. \hspace{1em} (\text{cf.:} \hspace{1em} \text{Sam was practicing law before Max began practicing medicine.})
\end{itemize}

A second kind of exceptional occurrence of this operator is more difficult to resolve:

\begin{itemize}
  \item \text{(?)} \hspace{1em} \text{John didn't come until the party was breaking up.} \\
       \hspace{1em} \text{I haven't seen Jack since (the time) we were fishing in Canada.}
\end{itemize}
These are definitely unusual occurrences of the t(be)...-ing operator and such paraphrases as the following are usually preferred:

John didn't come until after the party started breaking up.
By the time John came the party was already breaking up.

I haven't seen Jack since (the time) we went fishing in Canada.
The last time I saw Jack was when we were fishing in Canada.

In general the restriction (1.) above characterizes the vast bulk of normally acceptable $S_1 C_t S_2$.

2. The operator be...-ing with present tense morpheme does not occur in $S_1$ preceding before, after, until, since, and when.

In particular a good test frame is as reply to the question What's going on? or What is he doing?. The following responses are inappropriate because of the combination of tense morphemes and/or because of the use of the present tense morpheme with the operator be...-ing in $S_1$:

*Jack is reading the instructions before he is swallowing the medicine.
*She is crying after he left.
*She is watching the film until it finishes.
*They are using our swimming pool since the summer began.
*He is telling jokes when we are all sleepy.

When some $C_t$ has a function also as a $C_o$ or causal $C_s$ (with differing environment, of course) it is often the case that the appearance of the conjunction in violation of a restriction for $C_t$ such as (1.) or (2.) above forces the interpretation as a $C_o$ or $C_s$. 
For example, I am eating your ice cream since John came in must be understood with since because even though the causal connection may not be clear. Temporal since simply does not occur with this distribution of tenses and operators. For the more difficult separation of while see section III. C. 4.

3. The operator have...-en with present tense morpheme does not occur in $S_2$ following before, after, until, since, as, and while. Although present tense form occurs frequently in $S_2$ with have...-en, this can always be shown to be the reduced (i.e., zeroed) form of the future tense morpheme. Occasionally there may occur such forms as:

? I've seen John before you have.
? I've met Mary before I've met John.

Normally, however, these sentences are less acceptable than the corresponding sentences with past tense.

4. The operator have...-en with present tense morpheme does not occur in $S_1$ preceding before, after, until, while, as, and when.

It is not always easy to distinguish cases of have...-en which have been introduced as the trace of an operation on $S_1CtS_2$ (and hence do not belong to the $S_1$ -- see section C above) from cases which are properly resultants of the operation on the $S_1$ alone. Sentences like She has listened to that record until she is (was) blue in the face might be paraphrasable by It has occurred that she listened
to that record until she was blue in the face which is then a sentence operator on a regular $S_1 C_t S_2$ or, with a different reading, by She has listened to that record so much that now she is blue in the face. In the latter case, that is with the latter paraphrase as its reading, the form with until violates condition (4.) above, although the marginal acceptability seems to indicate that this is an extension of a more restricted general rule.  

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**E. Restrictions viewed as co-occurrence restrictions on $C_t$**

Several additional comments can be made at this point about the distribution of operators in the environment of the $C_t$. In the next chapter each $C_t$ is treated in detail with regard to these restrictions and the notion of aspect is used to simplify this description.

Although the description of what $C_t$ and what tense forms appear in the same $S_1 C_t S_2$ constructions can be made directly only by stating what co-occurrences are actually found, the indirect kind of description made in terms of sequences of operators gives a view of sentences as being 'generated' or 'decomposed' from other sentences. Taking the view of sentences being the resultants of processes on other sentences, we may choose to represent the $S_1 C_t S_2$ sentences

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9 For a description of how deviant sentences (and language change) may result from extensions of domains and operations see Harris, op. cit., particularly p. 198 and p. 215.
as resultants of a binary $\varphi_{C_t}$ operation on a specified domain of sentence pairs, or, alternately, as a kind of unary operation on $S_1$ which brings in a restricted kind of $C_t S_2$. For the immediate purposes of description it is convenient to consider $\varphi_{C_t}$ as a binary operation which may be followed (i.e., operated on) by a $\varphi_S$ which adjoins adverbs of time, and hence tense morphemes to the $S_1 C_t S_2$ at specified points. Thus the problem of specifying what $S_1, S_2$ can be $C_t$-conjoined is the problem of specifying the domain of a binary operation in terms of traces of preceding operators. A more complete discussion of some of the alternative formulations is given in chapter X.

The occurrence of the present tense morpheme with $S_1 C_t S_2$ sentences can be classified as either general present tense (e.g., John (usually) eats two eggs before he goes to school.) or now-present (e.g., John is eating an egg (at this moment). It is interesting to note that for those $C_t$ which function as inequalities (e.g., March came before April did, Winter will come after summer does, Autumn will last until winter begins), the now-present is not used:

*I am digging this hole (now) before I am planting this tree (now).
*He is reading (now) until he is getting sleepy (at this moment).

In terms of the sequence of operators which represent sentence differences, we would say that adverbs like usually are brought in

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10 See Harris, op. cit., p. 104.
by \( \phi_S \) which operate on all \( \phi_{C_t} \) (not the marginal since). On the other hand, the \( \phi_S \) which bring in at this moment, now, currently, and others do not operate on before, until, and after viewed as \( \phi_{C_t} \) operators.

F. Some consequences of the single tense hypothesis

For those \( C_t \) which do not occur with adverbs of the now-present, namely at least before, after, until (if not all \( C_t \) except while), any occurrence of present tense morpheme in sentences with \( C_t \)-conjunction must be derivable from either \( S \) inside the operand of a \( \phi_S \) operator verb with non-present morpheme or from some operator applied to the resultant of \( \phi_{C_t} \) and hence adjoined to \( S_1 \). Of course, as already mentioned, the zeroing of future will leaves apparent present form in \( S_2 \). In particular, performative verbs in present tense (e.g. ask, command) cannot appear in \( S_1, S_2 \) themselves, but only as part of sentence operators applied to strings which result from \( C_t \)-conjunction.

As outlined in the previous section, it becomes possible to view the tense operation as subsequent to the time-conjunction operation and hence to consider independently the traces of certain verb operators which, like be...-ing and have...-ing, which have traditionally confused the description of tense.
<table>
<thead>
<tr>
<th>BEFORE</th>
<th>Mary</th>
<th>will have been coming</th>
<th>will be coming</th>
<th>will have come</th>
<th>will have been coming</th>
<th>has been coming</th>
<th>comes</th>
<th>has come</th>
<th>had been coming</th>
<th>was coming</th>
<th>came</th>
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</table>

fContains zero future tense morpheme(s).

gIn general tense usage (e.g., with adverb usually, etc.)

hIn usage with sentence operator of occasional occurrence (e.g., It has happened on occasion that $S_1C_1S_2$).
<table>
<thead>
<tr>
<th>He ... here to live.</th>
<th>Troops ... the village.</th>
</tr>
</thead>
<tbody>
<tr>
<td>will have been coming</td>
<td>* * * * * * * * * * * *</td>
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<td>will be coming</td>
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<td>will come</td>
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<td>will have come</td>
<td>* * ? ? * * * * *</td>
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<td>had come</td>
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</table>

\(^c\) Acceptable in colloquial usage.

\(^f\) Contains zero future tense morpheme(s).

\(^g\) In general tense usage (e.g., with adverb usually, etc.)

\(^h\) In usage with sentence operator denoting occasional occurrence (e.g., It has happened on occasion that $S_1 C_t S_2$).
<table>
<thead>
<tr>
<th></th>
<th>Mary</th>
<th>will have been arriving</th>
<th>will be arriving</th>
<th>will have arrived</th>
<th>has been arriving</th>
<th>is arriving</th>
<th>has arrived</th>
<th>had been arriving</th>
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<td>SINCE (from the time that)</td>
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- Contains (phonetically) zero future tense morpheme(s).
- In general tense usage (e.g., with usually, etc.).
- In usage of sentence operator of occasional occurrence.

In English, e.g., it has happened on occasion that $S_1 C_t S_2$. 

In general tense usage (e.g., with usually, etc.).
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<tr>
<th>AS</th>
<th>He ... the fire</th>
<th>will have been leaving</th>
<th>will leave</th>
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\(^g\) In general tense usage (e.g., with usually, etc.)

\(^h\) In usage of sentence operator of occasional occurrence (e.g., It has happened on occasion that \(S_1C_tS_2\))
<table>
<thead>
<tr>
<th>She ... the phone</th>
<th>She ... the noise</th>
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<td>will have been picking up</td>
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</tbody>
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\(^f\)Contains (phonetically) zero future tense morpheme(s).
\(^g\)In general tense usage (e.g., with *usually*, etc.)
\(^h\)In usage of sentence operator of occasional occurrence (e.g., *It has happened on occasion that* $S_1C_tS_2$)
III. Aspect and the Description of Time Conjunctions

A. Aspect in Polish

Before describing the rather covert role of aspect in English let us sketch briefly the use of aspect in Polish where this notion has traditionally been used in the description of the verb system. Schenker describes Polish verbs as being either imperfective or perfective. Imperfective verbs are used when the context does not call for stressing the completion of the action; instead they emphasize the progressivity or repetition of the action. Perfective verbs are used to stress the completion of the action. Such distinctions are called verbal aspect.

There is a very significant set of relations between tense and aspect. Both perfective and imperfective verbs occur with past-tense forms. Both types of verb also occur in present tense forms, but denote present tense only for imperfectives. The perfective form of a verb in present tense form specifies completion of the action in the future. It has the distributional characteristics of a future tense form.

Generally Polish verbs occur in aspect pairs with one perfective and one imperfective verb which do not differ in meaning except for the difference in aspect. Only a few verbs do not occur in such pairs. Although the members of each pair may differ by a prefix or infix, they may also be suppletive so that they are paired on the basis of similar occurrence (i.e., meaning) and not on morphological grounds.

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2 Schenker, op. cit., p. 259.
Since many Polish perfective verbs are formed from their corresponding imperfectives by the prefixing of a morpheme which also appears independently as a preposition, let us give a fairly typical such verb pisać (write) in some of its usages:

**Imperfective Usages: pisać**

*(past tense)*

On pisać do domu codziennie.
(He wrote home every day.)
On długo pisać list do siostry.
(He took a long time writing a letter to his sister.)
On pisać list jak ja wszedłem do pokoju wczoraj.
(He was writing a letter when I entered the room yesterday.)

*(present tense)*

On teraz pisze list.
(He is writing a letter now.)
On pisze zabawne listy.
(He writes amusing letters.)

*(future tense)*

On będzie pisać często.
(He will write often.)
On będzie pisać ten list przez dwie godziny.
(He'll be writing that letter for two hours.)

**Perfective Usages: napisać**

*(past tense)*

On napisać długi list wczoraj
(He wrote a long letter yesterday.)
On napisać list wczoraj jak wróciliśmy do domu.
(He wrote a letter when we returned home yesterday.)

*(present tense)*

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*(future tense)*

On napisze krótki list.
(He'll write a short letter.)
On napisze książkę jak wróci do Stanów.
(He will write a book when he returns to the States.)
With adverbs and other modifiers signifying regular or habitual repetition the normal imperfective form is used. However, some verbs have a second kind of imperfective verb for the description of action which is "sporadically recurrent". For these verbs, the imperfective aspect has a subdivision into actual and frequentative verbs used as follows:

**Actual Imperfective**

(action in progress) Jan pisał listy cały dzień.
   (John was writing letters all day.)

(habitual action) Jan pisał do domu codziennie.
   (John wrote home every day.)

**Frequentative Imperfective**

(sporadically recurrent) Jan pisywał do domu od czasu do czasu.
   (John would write home from time to time.)

Another distinction is made for some imperfective verbs of motion between determined imperfective aspect and non-determined imperfective aspect where regular repetition is described with the non-determined imperfective usage:

**Determined Imperfective** (Motion Verbs)

(action in progress) Jan jechał ostrożnie.
   (John drove carefully., John was driving carefully.)

**Non-Determined Imperfective** (Motion Verbs)

(habitual action) Jan jeździł codziennie do pracy.
   (John drove to work every day.)

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3See Schenker, op. cit., p. 333.
(sporadically) Jan jeździł czasem do miasta.
(recurring) (John drove to the city occasionally.)

For these distinctions within the imperfective aspect, the usage of one form over the other corresponds closely to the possible co-occurrence with certain adverbs such as codziennie (every day), czasem (occasionally), and similar expressions such as w tej chwili (at this moment). Likewise, certain environments preclude or require the occurrence of perfective verbs. For example with operator verbs which specifically denote a beginning or an end, the imperfective is normally used:

(He began to write.)
Skończył jeść. *Skończył zjeść.
(He finished eating.)

For requests which are not negated, perfective verbs occur more frequently than imperfectives, whereas for negated requests, the imperfective form is more frequent:

Niech pan napisze ten list. Niech pan nie pisze tego listu.
(Write that letter.) (Don't write that letter.)

Also, for habitual actions, the imperfective is customary:

Palam papierosy. Lubię pisać listy.
(I smoke cigarettes.) (I like to write letters.)

It is significant for the function of aspect that a few common

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4 See Schenker, op. cit., p. 264.
5 Schenker, op. cit., p. 263.
6 Schenker, op. cit., p. 264.
Polish verbs do not have perfective counterparts:

miedo — have
wiedzieć — know, be aware of
musieć — must, have to
życzyć — wish
woleć — prefer
potrzebować — need

The fact that none of the English counterparts of these verbs occur in the imperative form will turn out to be significant for the study of English aspect undertaken in the following chapters.

It is also sometimes the case that a given imperfective form may have several perfectives related to it morphologically but only one of them is paired with it as differing only in aspect.

<table>
<thead>
<tr>
<th>Imperfective</th>
<th>Perfective</th>
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<td>pisać</td>
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<tr>
<td>podpisywać</td>
<td>podpisać</td>
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<td>przepisywać</td>
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B. The Use of Aspect in English

The relevance of aspect to a formal description of English structure can only be made convincing if it can be shown that the distinction between perfective and imperfective verbs in English goes beyond the problem of describing the conjoinability of sentences. In fact the distinction seems to hold a good deal of promise for organizing a formal description of language.

7Schenker, op. cit., p. 262.
Let us begin by outlining a class of perfective verbs and verb occurrences which fit certain simple frames giving acceptable sentences, and then outline similarly a class of imperfective verbs which do not fit the perfective frames and do fit certain other frames. For the most part, we will be working under the assumption that aspect can be treated as a binary distinction, and at least there should be no verb occurrence which is both perfective and imperfective. The question as to whether two aspects will suffice for English description is left open and the fact that different kinds of imperfectives can be differentiated in Polish should make one particularly cautious in formulating English structure. The aspectual status of the t(be) V-ing structure in English is particularly unclear although there are good reasons for distinguishing it from the class of perfectives.

Consider first the verbs which normally occur with expressions of the kind at a particular time, at that time, at 6 a.m., and sometime next week. For many such verbs or verbal occurrences, the adverb suddenly is also natural. Such occurrences are explode, die, leave, hit, get up, and notice in:

The bomb exploded at 6:47 a.m.
The queen died suddenly this morning.
John left the room suddenly.
The cruiser hit the rocks at dawn.
John got up suddenly.
All of a sudden I noticed that there weren't any lifeboats.

Now let us try using the same verbs with expressions like for a while,
for three hours, and for a certain length of time:

? The bomb exploded for a while.
* The queen died for three hours.
* For ten minutes John left the room.
** For a certain length of time the cruiser hit the rocks.
* For a long while John got up.
** For a certain length of time I noticed that there weren't any lifeboats.

In general the sentences immediately above are of low acceptability and then only with a reading which allows the addition of repeatedly and similar adverbs denoting iteration. Occurrences of the verbs in the first group of sentences will be considered perfective.

Let us now consider a set of verbs which occur freely with expressions of the second type but less freely with expressions of the first type:

John waited for Mary for three hours.
? John waited for Mary at 6 p.m.

He watched television for a while.
? He watched television at a particular time.

I used the car for most of the week.
? I used the car at the crack of dawn.

He practiced playing the piano for a few minutes.
? He practiced playing the piano a few minutes ago.

We kept swatting mosquitoes for quite a while.
? We kept swatting mosquitoes just now.

In most occurrences, the verbs wait, watch, use, practice, keep will be used imperfectively, i.e., with adverbs in the group of

\[8\] For the purposes of this description many PN phrases are treated together with the adverbs of time in a class \(D_t\).
for a length of time.

Although we can enlarge the groups of perfective and imperfective verbs by finding more verbs most of whose occurrences fit these tests, there are still important classes of verb occurrences which do not easily fall into one or the other of these two groups. One important occurrence is the verb be in t(be) Ving. We have She was watching television for three hours as well as At five o'clock she was watching television. But we do not have Suddenly she was watching television except in the paraphrase Suddenly she began watching television. By the last test we would exclude be from the group of perfectives in this occurrence although it occurs with at a particular time much more easily than most imperfectives.

Perhaps the crucial test comes in the nominalization form with certain appropriate verbs used in the nominalizations of conjoined sentences considered in section II. C.

(The bomb's exploding) occurred at a particular time.
? (John's watching television) occurred at a particular time.
  happened
* (John's being watching television) occurred at a certain time.
* (John's being in the process of watching television) occurred at a certain time.

For all the perfective occurrences considered here, the sentence can be nominalized and inserted into the frame ( ) occur(red) at a particular time. Since t(be) Ving constructions do not have an appropriate nominalization, we may consider an appropriate paraphrase given by Harris as is in process of Ving, i.e., John is
reading a book is paraphrasable by John is in process of reading a book, so that we may test the acceptability of John's being in the process of reading a book occurred at a particular time. This is quite low, and in particular is much lower that the relatively normal John's being in the process of reading a book lasted for a length of time. This last sentence uses a frame which fits most of the nominalized imperfectives with relative naturalness. For this reason we will tentatively group the t[be] Ving occurrences with the imperfectives although some refinement of the classification will almost certainly separate these occurrences from other imperfectives.

Similarly, the bulk of the class of stative verbs, i.e., like, prefer, wish, need, and similar verbs which do not normally occur with the t[be] Ving operator, fit more naturally with the imperfectives although they rarely occur with definite time descriptions for ten years, etc. With the frames for distinguishing imperfectives from perfectives: ( )t[:last] for a length of time as opposed to ( )t[occur] at a certain time, the nominalized statives are acceptable only in the former.

Let us proceed with this approximate characterization of the aspect of verbs through testing of the acceptability of certain occurrences of these verbs in test frames such as those used above.

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9 See Harris, op. cit., pp. 85-86.
C. Aspectual Restrictions of the Domain of Conjunction by $C_t$

A detailed survey of acceptable sentences of the form $S_1 C_t S_2$ reveals that the domain of $C_t$, considered here as a binary operator on sentences, is restricted in the aspectual occurrences which each of the $S$ may have. Under this view of sentence conjunction by $C_t$, each such conjunction operates on a specific domain of sentence pairs restricted with respect to aspect. For example, _before_ operates with $S_2$ restricted to perfective occurrences and _until_ operates on pairs where $S_1$ occurs imperfectively and $S_2$ occurs perfectly. The restriction on aspectual occurrence which each $C_t$ imposes is sufficiently strong that certain degeneracies are permitted in usage in much the same way that degeneracies, and hence ambiguities, of tense are permitted on the basis of the single tense restriction.

In particular, specifically perfective occurrences of _become_, _come to be_, _get to be_, etc. are replaceable by _be_ when in the environment of $C_t$. In order to show that _was_ occurs perfectly as a replacer for some verb such as _become_ in _John soaked the spaghetti until it was soft_, it is sufficient to show that it is paraphrasable (in its acceptable reading) by the sentence with a perfective verb (one which occurs only perfectly) and hence can occur with the kinds of modifiers (perhaps in apposition) which characterize the perfective occurrences. Since we have _John soaked the spaghetti until it became_
soft as a paraphrase, we can confirm the perfective occurrence of
be in the conjoined sentence. As will be shown in chapters IV and V,
English has a number of verb operators which give resultants which
do not occur in one of the two (tentatively stated) aspectual occurrences.
In effect, such operations "perfectivize" or "imperfectivize" their
operands by restricting the occurrences of the resultants. The
occurrence of such an operator (e.g., the perfective t(begin)) in
a non-matching frame usually results in a sentence of low accept-
ability, e.g., *He began loading bricks until the whistle blew.

Let us now look at the Ct individually and characterize their
operator domains in terms of the aspectual restrictions.

1. before and after

Since the domain restrictions for before and after are virtually
the same and since they are almost mirror images of each other
semantically, they can be treated together for this discussion.
Both before and after operate on sentence pairs where S2 occurs
perfectively. For S1 there seems to be no strict limitation although
perfective occurrences seem to be more frequent. Perhaps the
instances of imperfective occurrence in S1 can be shown to be
in the resultant of some zeroed perfective operator, or characterized
in some compact way. No attempt has been made to do so here. Let
us consider some S1CtS2 of varying acceptability using Ct equal to
before or after and check to see whether the hypothesis about aspect is confirmed:

(1) After Mary left the party, Tom was talking about her.

\[ S_2(\text{perfective}) \quad S_1(\text{imperfective ?}) \]

Decisions are reached on the aspectual occurrence of left and was talking on the basis of paraphrases and near-paraphrases which test the co-occurrence with certain modifiers. For (1) we have

After Mary left the party, which occurred suddenly at 11 p.m.,

Tom was talking about her, which indicates the perfective occurrence of \( S_2 \) (which confirms the aspectual restriction given for \textit{after}). In determining that was talking occurs in a non-perfective usage we consider, for example, the fact that addition of suddenly to \( S_1 \) is unnatural. Also, the addition of a second sentence in position following \( S_1 \) can repeat the \( S_1 \) with an expression of time without changing the way in which \textit{After} \( S_2 \), \( S_1 \) is interpreted: He was talking about her for ten minutes. Next we consider the fully natural:

(2) After Mary left the party, Tom started talking about her.

\[ S_2(\text{perfective}) \quad S_1(\text{perfective}) \]

To establish that \( S_1 \) occurs perfectively here, we note that suddenly may be added naturally to it. Also we note that Tom's starting to talk about Mary occurred after she left the party is a paraphrase of (2) which uses the perfective frame of previous tests for \( S_1 \).

Further explications of the aspectual occurrence can be carried
out in a similar manner for the following examples and will be given explicitly only when the decision requires some special device or involves an important ambiguity.

(3) ?* After Mary was leaving the party, Tom started talking about
   $S_2$(imperfective) $S_1$(perf.) her.

(4) ?* We met him after he was nice.
   $S_1$(perfective) $S_2$(imperfective ?)

In $S_2$ of (4) we have several readings where be can be a replacer for a perfective verb: He became nice, He started being nice, He stopped being nice. But since He was nice rarely occurs with time expressions at all, it does not readily take any of these readings and hence is not normally in the domain of after.

(5) (?) They used to smoke before the medical warnings came out.
    $S_1$(imperfective) $S_2$(perfective ?)

If $S_2$ is paraphrasable by The medical warnings came out together, or The medical warnings came out all at the same time, then it fits the perfective test frames. If it is paraphrasable by The medical warnings came out, one after another, then $S_2$ fits the imperfective test frames and does not belong to the domain of before.

(6) They used to smoke before the medical warnings started coming
    $S_1$(imperfective) $S_2$(perfective) out.

(7) ?* They used to smoke before the medical warnings kept coming
    $S_1$(imperfective) $S_2$(imperfective) out.

(8) ?* They stopped smoking before the medical warnings kept coming
    $S_1$(perfective) $S_2$(imperfective) out.
Under certain conditions it is possible to say that \( S_1 \text{ before } S_2 \) is an informational paraphrase of \( S_2 \text{ after } S_1 \). Primarily, it is required that both \( S_1 \) and \( S_2 \) have perfective occurrences. Then for sentences like \( \underline{\text{John came}} \text{ before } \underline{\text{Mary left}} \) we have the form \( \underline{\text{Mary left}} \) \( \underline{\text{after John came}} \) as a paraphrastic equivalent. This does not take into account, however, the fact that \( S_1 C_t S_2 \) often seems to assert \( S_1 \) and presuppose \( S_2 \) to be true along with asserting something about an inequality in the set of possible time expressions which can be added to the respective \( S \). Thus even for these simple bi-perfective sentences the two forms are paraphrases only up to the difference between assertion and presupposition.\(^1\) Also, for \( C_t \) which also have causal readings, these readings are not preserved by the reversal, e.g.:

(10) Mary fainted after she heard the news about John.
(11) Mary heard the news about John before she fainted.

In the causal reading of (10) \( \text{after} \) is replaceable by \( \text{because} \), but the corresponding causative reading of \( \text{before} \) (i.e., \( \text{so} \)) is not nearly as strong a reading. Similarly (12) and (13) have additional causative readings, but they are not the same:

(12) The stores closed after Mary did her shopping.
(13) Mary did her shopping before the stores closed.

2. until

The conjunction until is particularly important because it provides a frame which correlates well with other frames for testing imperfectives. As a rule, until occurs with the domain of S₁ restricted to imperfective occurrences and the domain of S₂ restricted to perfective occurrences. The frequent use of negation in the S₁ before until raises some important questions about the imperfectivizing effect of the negation operation and about the scope of this negation in various kinds of conjoined sentences. Some of these questions will be treated in sections IV, D. and V.

The regularity with which verbs occur imperfectively in S₁ preceding until allows us to test perfectivizing operations and perfective occurrences of verbs as follows: To test that a verb operator $\exists_{\nu}$ perfectivizes its operand verb effectively, we choose S₁ such that both S₁ until S₂ and $\exists_{\nu}(S₁)$ occur naturally as sentences, but $\exists_{\nu}(S₁)$ until S₂' does not for any S₂'. For example, up has the effect of perfectivizing use in the sentence John used up Mary's toothpaste because *John used up Mary's toothpaste until S₂ presumably does not occur for any S₂ but John used Mary's toothpaste until she bought him a tube does occur.\(^{11}\) The fact that $\exists_{\nu}(S₁)$ until S₂ does not occur may, for some cases, not be enough

\(^{11}\) As it stands (without further modifiers) the reading as John repeatedly kept using up Mary's toothpaste for S₁ is difficult.
to exclude $\text{if} \, \text{ until } \text{S}\text{'}_{2}$ from occurring for some sentence as $\text{S}\text{'}_{2}$; thus we do not require only that $\text{if} \, \text{ until } \text{S}_{2}$ not occur.

The relative uniformity of the until-frame allows us to look at a number of things closely, among them the difference between the $(\text{t}(\text{be}) \text{ Ving})$ constructions which fit some of the imperfective frames and the "durative" verbs like watch, listen, stay, and wait which are the most naturally occurring verbs in the imperfective frames.

Although a great deal of work remains to be done on these problems, many subtleties can be brought out by using this frame.

Let us look at a set of related sentences which use until as $\text{C}_{t}$:

(14) Alex danced until the music stopped.
      $S_{1}$ (imperfective) $S_{2}$ (perfective)

(15) Alex kept dancing until the music stopped.
      $S_{1}$ (imperfective) $S_{2}$ (perfective)

(16) Alex continued to dance until the music stopped.
      $S_{1}$ (imperfective) $S_{2}$ (perfective)

(17) (?Alex was dancing until the music stopped.
      $S_{1}$ (imperfective ?) $S_{2}$ (perfective)

With the four variant forms for $S_{1}$ given in (14) - (17) all are classified as imperfectives by the possible addition of for an hour although this generally makes the until $S_{2}$ act as if in apposition to the new $S_{1}$ containing the modifier (for an interpretation of this fact, see chapter VI.)
**18** *Alex danced until the music was stopping.*  
\[
S_1(\text{imperfective}) \quad S_2(\text{imperfective ?})
\]

For \(S_2\) in **18** the addition of *suddenly* is not comfortable. The only possible readings giving some degree of acceptability are like

*Alex danced until something happened at the time the music was stopping* which is in support of the perfectivity restriction for \(S_2\).

**19**  
*Alex didn't dance until the music stopped.*  
\[
S_1(\text{imperfective}) \quad S_2(\text{perfective})
\]

**20**  
*Alex danced until the music didn't stop.*  
\[
S_1(\text{imperfective}) \quad S_2(\text{imperfective})
\]

**21**  
*Alex began to dance until the music stopped.*  
\[
S_1(\text{perfective}) \quad S_2(\text{perfective})
\]

**22**  
*Alex didn't begin to dance until the music stopped.*  
\[
S_1(\text{imperfective}) \quad S_2(\text{perfective})
\]

**23**  
*Alex finished dancing until the music stopped.*  
\[
S_1(\text{perfective}) \quad S_2(\text{perfective})
\]

**24**  
*Alex didn't finish dancing until the music stopped.*  
\[
S_1(\text{imperfective}) \quad S_2(\text{perfective})
\]

In examples **19** - **24** it is clear that negation is much more comfortable in \(S_1\) than in \(S_2\). One interpretation of this is in

accordance with the hypothesis about aspect restrictions is that

negation is an operation which gives an imperfective resultant. This view will be elaborated upon in chapter IV, but here it can be shown that negated verbs by and large satisfy tests for imperfectivity. We note that *suddenly* cannot be added with normal acceptance to any of the negated \(S\). It is also significant that we may add time expressions of duration (with resulting apposition) to these negated \(S\):
(22') Alex didn't begin to dance for twenty minutes, (or) until the music stopped.

Also compare (19) with the following paraphrase:

(19') (Alex's not dancing) lasted until the music stopped.

We might also offer the paraphrase:

(19'') Alex refrained from dancing until the music stopped.

in which the verb refrain fits the imperfective frames well. Thus negation behaves in many ways as an imperfectivizing operation and will be considered alongside other imperfectivizing operators in chapter IV.

The preceding examples also support the notion that begin and finish function as perfectivizing operators and that keep and continue act to imperfectivize. There is also indication that the t(be) Ving operation is sufficient to imperfectivize, i.e., most resultants of this operation occur imperfectively. Also the trace of this operation occurs only rarely in $S_2$ following before, after, and until, all of which do accept perfective occurrences in this position. Some additional comments on the t(be) Ving operation are given in chapter VII.

Let us look at still another set of $S_1$ until $S_2$, this time where the $S$ are of forms such as $N_1$ t(be) $N_2$ and $N$ t(be) A:

(25) John was happy until he heard the news about Peter.  
$S_1$(imperfective) $S_2$(perfective)

(26) He heated the horseshoe until it was red.  
$S_1$(imperfective) $S_2$(perfective)
(27) These beaches were white until the oil washed ashore. 
S₁(imperfective) S₂(perfective)
(28) I raised that pine tree until it was coniferous. 
S₁(imperfective) S₂(perfective ?)
Examples (25) - (28) represent sentences using N t(be) A forms
for either S₁ or S₂. In (26) and (28) there are paraphrases with
N was A replaced by N became A where this become occurrence meets
the tentative requirements for perfectivity given previously. For (28),
however, this paraphrase is of low acceptability, primarily because
coniferous is used almost exclusively as a classifier adjective,
i.e., one which rarely occurs with any time expressions in contrast
with its use as a defining adjective. That is because any temporal
modification conflicts with the permanence of the classification.
In a secondary usage of coniferous as literally cone-bearing the
S₂ of (28) becomes marginally acceptable with perfective modifiers.

For the following N₁ t(be) N₂ usages, the existence of classifier
usages for some forms conflicts with both perfective and imperfective
frame environments. In many cases, however, there is an acceptable
reading with t(be) as replacer of t(become) or some other perfective
verb:

(29) (?) John was a musician until he resigned from the union. 
S₁(imperfective ?) S₂(perfective)
(30) * Atlantis was an island until it sank into the sea. 
S₁(imperfective ?) S₂(perfective)
(31) John didn't learn to ski until he was a man.
   $S_1$(imperfective) $S_2$(perfective)

(32) ? I raised that pine until it was a tree.
   $S_1$(imperfective) $S_2$(perfective ?)

In each case, the acceptability of the occurrence of the $N_1$ t(be) $N_2$
in either $S_1$ or $S_2$ depends largely on the extent to which it has
readings in addition to the classifier reading. For example, we have
the four corresponding paraphrases which preserve the acceptability:

(27) (?) John continued to be a musician until he resigned from the
   $S_1$(imperfective) $S_2$(perfective) union.

(30) ?* Atlantis continued to be an island until it sank into the sea.
   $S_1$(imperfective) $S_2$(perfective)

(31) John didn't learn to ski until he became a man.
   $S_1$(imperfective) $S_2$(perfective)

(32) ? I raised that pine until it became a tree.

For (31) there still may be a reading in which $S_2$ is really imperfective.
This seems to be related to the negation in $S_1$ and needs further
study. For (32') the possibility of other classifiers of a temporary
nature, e.g., That pine is only a seedling, not a tree, makes
possible the paraphrase with become. Likewise the possibility of
saying That pine became coniferous with marginal acceptability is
tied to the possibility of saying That pine wasn't coniferous because
it had no cones.
3. since

Temporal since (as opposed to causal since) represents a rather anomalous variety of $C_t$ which discourages classification along with the other $C_t$. First of all, virtually the only usage of since as a $C_t$ is with have Ven in $S_1$ plus past tense morpheme in $S_2$ or else had Ven in $S_1$ plus past tense morpheme in $S_2$. Although since gives the same kind of time inequality ordering in the set of time expressions as until, since does not appear with future tense in either $S_1$ or $S_2$ and never appears with imperatives. Furthermore, since does not appear with simple past tense in $S_1$ and does not appear in the "general present"
tense usage with usually, always, etc. As mentioned earlier, since does not obey the tense conformity constraint since have Ven must be treated as a present tense plus t(have) Ven operation and $S_2$ is always in the past tense.

Thus the canonical form of a $S_1$ since $S_2$ is one of the following:

- $N_1$ has been $V$ing $\Omega_t$ since $N_2$ $V$ed $\Omega_2$
- $N_1$ has $V$ed $\Omega_t$ (n times) since $N_2$ $V$ed $\Omega_2$ or:
- $N_1$ had been $V$ing $\Omega_t$ since $N_2$ $V$ed $\Omega_2$
- $N_1$ had $V$ed $\Omega_t$ (n times) since $N_2$ $V$ed $\Omega_2$

A study of existing usage shows that a simple $N_1$ has Ven $N_2$ does not usually occur without some expression of iteration for $S_1$. For example:

- I have seen John since I got back from Europe.
is almost unacceptable without contrastive stress or without some iteration expression:

I've seen John only once since I got back from Europe.
I've seen him several times since I got back from Europe.

It also appears that the negation or question operator improves the acceptability significantly:

Have you seen John since you got back from Europe?
I haven't seen John since I got back from Europe.

When the trace of the t(be) Ving operator is not present, seems to occur primarily with time expressions of iteration. Without such expressions as seven times, (only) once, repeatedly, such verbs occur more frequently with the past tense and a past time expression.

In general, the copulative structures under the have Ven operation N has been N, N has been A (and the corresponding past tense forms) fit in S₁ provided, as with 'until', that the addition of an adverb of specific duration (e.g., for a certain length of time) to the S₁ is possible. For example:

Sam has been a carpenter since he got out of high school.
Cuba has been a republic since it declared its independence.
John has been sick since he returned from the tropics.
Gambling has been legal in Nevada since it became a state.
Crows have been black since the world began.
? Uranium has been an element since it was discovered.

The possibility of acceptability for the last example is due to the paraphrase: Uranium has been considered to be an element since it was discovered.
A wide variety of durative (i.e., imperfective) forms fit quite naturally in $S_1$:

She has been on the phone since she got home from work. They have lived in Westport since they graduated from college. He has continued to feel well since he recovered from the operation.

Because have Ven does not seem to operate on many container verbs (e.g., believe) and other stative verbs (e.g., like), there are virtually no occurrences of such verbs in $S_1$ preceding since. This may not be true of all idiolects, however.

To the extent that since behaves as a $C_t$, it can be described as operating on the aspectually restricted domain where $S_1$ occurs imperfectively and $S_2$ occurs perfectly. Negated perfectives with the have Ven operation (perfective verbs under have Ven in turn negated) fit easily into $S_1$ frames:

He hasn't budged since we arrived.
He hasn't spoken a word since he saw the ghost.
John hasn't hit Mary since we got here.

For perfectives which do not take expressions of iteration in their normal usages (in the same context) it seems inappropriate to use since:

(33) The bomb hasn't exploded since we arrived.
(34) We haven't invited him to the party since we decided to have it.

But again, the stressing of some element such as we in the sentences above does raise the acceptability. And such sentences usually
are replaceable by $S_2$. $S_1$ yet:

(35) We arrived (at some time). The bomb hasn't exploded yet.
(36) We decided to have the party. We haven't invited him to it yet.

For the purpose of description, it may be possible to say that since is a part of the have $\text{Ven}$ operation which has as a variant the form yet (with corresponding permutations, etc.) when applied to a certain subclass of perfectives. One must account, however, for such things as the fact that in (36) the perfectivity is related to the adjunction of a restrictive $\text{wh-called}$ clause.

For the present we can describe since along with the other C_t under the qualifications just mentioned. The fact that since does not obey the single tense constraint and the other anomalies in the behavior of this marginal C_t point to a different source for since in a transformational theory.

4. while

Although while exhibits occurrences in keeping with the single tense constraint, there is some difficulty in describing the aspectual behavior for while. Because of the existence of the co-ordinating conjunction (C_o) while_o, the properties of the S cannot be described as precisely as might otherwise be the case. Consider, for example:

Copper is an element while_o brass is a mixture of elements. John was resentful while_o Max was absolutely spiteful.
Dinner was served while coffee remained on the buffet. Mary read a book while Pete swam. I saw the movie while you were in Washington.

These five sentences range from relatively unambiguous usage of co-ordinating while = whereas = but, to a relatively unambiguous usage of subordinating while = during the time that in the final example. Normally, for ambiguous usages such as the third and fourth examples some intonation markers can distinguish one usage from the other. Indeed, the final example can be given co-ordinate reading by using the same stress pattern as occurs in the preferred reading of the first example.

In characterizing the kinds of verb constructions with respect to aspectuality which may occur in $S_1$ while $S_2$ sentences, there are additional problems caused by the overlapping of while, as, and when. Within certain limits this overlapping may encourage analogical usage of one of these $C_t$ in place of another. For the analysis of while, let us look at some usages which are characteristic for this $C_t$. In cases where while cannot be replaced by when or as, this will be indicated by *when and *as respectively.

(37) The table fell apart while you were away. (*as, ?when)
(38) We crossed the street while the light was red. (*as)
(39) We listened while Jim told the story of the Windigo.
(40) I found a table while John was getting a drink.
(41) Bananas should be picked while they are (still) green. (*as)

(42) John is reading while Mary does the dishes. (*as, *when)

Note that (42) represents the now-present as the common tense usage for $S_1$ and $S_2$.

(43) They stole his tools while he wasn't looking. (*as)

(44) I noticed the fire while I was getting out of my car.

(45) "There will be no tax increases while I am president." (*as)

(46) Travel as much as you can while you're (still) young! (*as)

(47) Andy was sick while you were gone. (*as, ?when)

Looking at the form of $S_2$, we notice NVA structures ((38), (41), (46)) and $N_1\,\text{be}\,N_2$ ((45)), both with non-permanent readings. Basically, while operates on pairs where the verb of $S_2$ can occur with durative time expressions such as for an instant, for a moment, etc. though the verb may normally occur perfectively. For such perfective verbs, the occurrence in $S_2$ following while is usually under the operator $t(\text{be})\,\text{Ving}$. For (40), (42), and (44), the verb of $S_2$ normally occurs perfectively: John got a drink, Mary did the dishes, I got out of my car. In addition, the verb be occurs following while usually with the imperfective reading for the copulative structures which are not classifier sentences. $S_1$ often has a perfective occurrence, but imperfectives seem to occur as well provided that the durative time
expressions which can be added preserving paraphrase are a subset of those which can be added to \( S_2 \). The use of negation in \( S_2 \) seems limited to verbs which have a particularly strong durative effect, e.g., \textit{wait, listen, watch, etc.} We have difficulty with \textit{It happened while I wasn't reading} more than with \textit{It happened while I wasn't listening}.

According to the type of test used for determining perfectivity in the discussion of \textit{before, after, and until}, the conjunction \textit{while} can almost be classified as requiring imperfective \( S_2 \) with no specific requirement on \( S_1 \) other than that the modifiers on any imperfective \( S_1 \) be a subset of the possible modifiers of their respective \( S_2 \). Certainly, for many speakers there is difficulty with:

\begin{itemize}
  \item \? The bomb exploded while Jack opened the door.
  \item \? Mary read while Jack took a swim.
  \item \* A shot rang out while Max began to eat.
\end{itemize}

In general, some imperfectivizing operator on \( S_2 \) has the effect of raising the acceptability of these sentences. Where productive perfectivizing operators (see next chapter) are responsible for the perfectivity, acceptability is improved by removing them:

\begin{itemize}
  \item The bomb exploded while Jack was opening the door.
  \item (?) Mary read while Jack swam.
    (cf. \textit{Mary read while Jack was swimming}.)
  \item (?) A shot rang out while Max was beginning to eat.
    (cf. \textit{A shot rang out while Max ate, A shot rang out while Max was eating}.)
\end{itemize}
The use of present tense (the now-present) with while may be marginally acceptable and usually gives a secondary reading of future tense due, perhaps, to the general non-occurrence of now-present tense with the other Cₜ. Still, it does seem to occur in current speech:

Q: What's going on?
A: (?) We're waiting while he fixes the flat tire.

5. as

The usage of as as a Cₜ becomes a little clearer if the examples for while are used for comparison. Let us consider:

The bomb exploded as Jack opened the door.
(?) A shot rang out as Max began to eat.
   I noticed the fire as I was getting out of my car.
   I noticed the fire as I got out of my car.
   He will mail this letter as he leaves.
(cf. *He will mail this letter while he leaves.)
(cf. ? He will mail this letter while he is leaving.)

A large number of occurrences of as operate on two perfective S and are often roughly equivalent to the corresponding S₁ when S₂ sentence conjunctions but not to the S₁ while S₂. The last group of examples give occurrences of this kind.

For some S₁ as S₂ we can add step-by-step or by degrees to both S₁ and S₂. For these in particular the occurrence of as is not replaceable by while or when:

As the campfire died down, the brightness of the moon became more noticeable.
(?) While the campfire died down, the brightness of the moon became more noticeable.
He became more and more aware of the contradictions in the system as he grew older.

? He became more and more aware of the contradictions in the system while he grew older.

In general, the aspectual restrictions for as are not clear, but are close to a domain restricted to perfective occurrences for $S_2$ and also (but perhaps less rigidly) restricted to perfective occurrences for $S_1$. In addition to a lack of imperfectivizing operator traces in $S_2$ (other than some $t$ be Ving), there are virtually no negated $S_2$, another sign of $S_2$'s being a perfective frame.

Unlike while, as seems not to occur with the now-present (although it occurs naturally with the general present with usually, frequently, etc.). It is, of course, clear that as conforms to the single tense restriction. In fact, the appearance of $S_1$ as $S_2$ with non-conforming tenses signals the interpretation of as as though or because, neither of which behaves like $C_t$.

6. when

In a way the $C_t$ when is one of the most revealing $C_t$, although as a time conjunction it appears to be replaceable by other conjunctions plus some other additional change. It is revealing because it exhibits the wh- morpheme of who, which, what, and where. This occurrence will be quite useful in supporting the view that conjunctions of time mark the sharing of temporal adverbs in a way
similar to the way in which the wh- of who, what, and which marks
the noun sharing between two sentences in the relative clause forma-
tion. Other $C_t$ can then be seen as equivalent to $when$ at the time at
which plus further ordering restrictions on the set of time expressions
which may be added to the two $S$.

Let us divide the two major usages of $when$ into $when_1$, paraphrasable by (immediately) after, and $when_2$, paraphrasable by
while plus reversal of $S_2$ and $S_1$. Let us dispense with $when_2$ by
giving some examples to illustrate this reading:

I was walking down the street $when_2$ (all of a sudden) I slipped
on a banana peel.
I slipped on a banana peel while I was walking down the street.

Max was shining his shoes $when_2$ Pete walked in.
Pete walked in while Max was shining his shoes.

Naturally, the statement of equivalence or paraphrasability is
accurate only up to the difference between assertion and presupposi-
tion as explained in section B.1. of this chapter for the discussion
of before and after.

The current usage of $when_1$ suggests that $S_1 when S_2$ is paraphras-
able by $S_1 at the time at which S_2$. Since $when_1$ often occurs in narrative
where causal modifiers may also occur (e.g., because, consequently),
a primary usage is paraphrasable by (immediately) after:

They cheered when they got the good news.
They cheered (immediately) after they got the good news.
She will open the door when you give the signal.
She will open the door (immediately) after you give the signal.

A number of other usages, however, have a paraphrase much closer to the explicit expression of identity:

We had just finished dinner when the telephone rang.
(cf. We had just finished dinner at the time at which the telephone rang.)

For these usages, when acts as an operation on pairs restricted to perfective verb occurrences for both \( S_1 \) and \( S_2 \).

In some of its imperfective occurrences when seems to be replaceable by other conjunctions or conjunctonal phrases:

They were tired when they arrived home.
(cf. They were tired by the time they arrived home.)

He sings when he drives.
(cf. He sings while he drives.)

7. multiple usages: until after, since before

The compound \( C \) \( C' \) \( t \) \( t \) usages which are not uncommon can often be regularized as two separate conjunction operations, each of which has the same domain as usual and such that the zeroed repetition of \( S_1 \) is recovered (with one operator trace) between \( C \) \( t \) and \( C' \) \( t \). Thus we have \( S_1 C \) \( C' \) \( t \) \( t \) \( S_2 \) \( = \) \( S_1 C \) \( t \) \( (\text{neg}(S_1) \) \( C \) \( t \) \( S_2 \) ) \) where negation operation \( \text{neg} \) (S) is a simple rule which removes the not operation or, if the operand verb has not been negated, operates as \( t \) (stop) \( V\) ing before after and as \( t \) (start) \( V\) ing preceding before:
I didn't see John until after the party ended.
I didn't see John until (I saw John after the party ended.)

I stayed until after the show closed.
I stayed until (I stopped staying after the show closed).
(i.e., I left)

I haven't seen Joe since before he sailed to Australia.
I haven't seen Joe since (I saw him before he sailed to Australia).

This regularization procedure is effective also in preserving
certain adverbial modifiers:

I didn't find my ticket until just before the show started.
I didn't find my ticket until (I found my ticket just before
the show started).
IV. Verb Operators and Aspect

A. The Function of Verb Operators

Let \( \varphi_v \) be a verb operator if it is an operation of a string \( NV\Omega \) which leaves a trace of the form \( NV'(P)V\Omega \) where \( V' \) is a new verb which occurs as the carrier of the tense morpheme. The various operators which fall into this class can be grouped according to their general distributional co-occurrences (and hence characterized in terms of modifiers) and also with respect to which verbs they take in the operand strings. For the investigation of the time conjunctions \( C_t \), an important feature of the deformed resultant string is its aspec-tual occurrence compared with that of the original (operand) string.

In addition to the operators which have the entire class \( V \) or most of this class in their domain of operation, there are many which take as operands certain verbs from a very small (perhaps unitary) class.

For the verb operators under consideration in this chapter, the resultant string has a different aspec-tual occurrence of its verb than the aspec-tual occurrence of the operand verb. Hence we may say that such an operator "perfectivizes" or "imperfectivizes" its operand verb if it changes the aspec-tual occurrence of the resultant to perfective or imperfective respectively. As before, we may extend this terminology to sentences containing the verbs.
Since the previous chapter has demonstrated, somewhat implicitly, that the frame of $S_1$ preceding until correlates closely with other frames used for testing imperfective occurrences, we may now use this frame as one in which perfective occurrences are impossible to roughly the same extent as they are impossible in $(S_1)_h$ happened at a particular time. Likewise, we may freely use the frame of $S_2$ following before or until or after as a good perfective frame since it correlates well with other perfective frames. For example, as described in section III. C. 2., we may test to see that a putative perfectivizing operation changes acceptable $S_1$ until $S_2$ into unacceptable $*_{\varphi_y}(S_1)$ until $S_2$ under the assumption that de-imperfectivizing means the same for these purposes as perfectivizing. When the operator has this effect, we can claim that the operator has "blocked" the usual imperfective occurrence for that frame thus giving a form outside the domain of operation for until. Likewise, we may test a putative imperfectivizing operation by seeing whether acceptable sentences of the form $S_1$ before $S_2$ are transformed into corresponding unacceptable $*S_1$ before $\varphi(S_2)$. This shows that the operator acts to 'block' the normal perfective occurrence. Of course, an imperfective sentential string may be first perfectivized and then in turn imperfectivized by a new operator as in John ate strawberries which becomes perfective with John started to eat strawberries and
then imperfective with John kept starting to eat strawberries.

Although more than two such operations seldom appear in the same verbal string, there seem to be no length restrictions except, perhaps, that two consecutive words with -ing morpheme are unusual, e.g., John kept starting eating strawberries.

For most $S_1C_tS_2$ where $S_1$ and $S_2$ occurring in isolation may be ambiguous with regard to aspect (e.g., John ate until he was sick, where John ate and John was sick are ambiguous) the occurrence in the frame itself is sufficient to give the preferred reading to the occurrence which fits the frame. Thus, we do not get John ate until he was sick paraphrased as *John ate until he continued being sick, or *John began to eat until he was sick.

It is possible to predict that certain verbs will not be used in an imperfectivizing operator and that certain other verbs will not be used in a perfective frame without an appropriate perfectivizing operator. For example, we do not normally get ?* Mary shot John until $S_2$ or ?* $S_1$ before John enjoyed skiing. But we may have Mary kept shooting John until $S_2$ and $S_1$ before John came to enjoy skiing or $S_1$ before John began to enjoy skiing.

B. Unrestricted perfectivizing operators: begin, start, stop, etc.

The following operator verbs give perfective occurrences with
all or most verbs in the language:

**begin:** John read until he reached page 110.
  ?*John began to read until he reached page 110.

**start:** John listened to the radio until the program signed off.
  ?*John started listening to the radio until the program signed off.

**stop:** They danced until the sun came up.
  ?*They stopped dancing until the sun came up.

**quit:** We smoked until we heard the ACS ad.
  ? We quit smoking until we heard the ACS ad.

**cease:** We talked until we came to grandmother's house.
  ? We ceased talking until we came to grandmother's house.

**finish:** We worked on the barn until the sun set.
  * We finished working on the barn until the sun set.

**resume:** We danced until the music stopped.
  ? We resumed dancing until the music stopped.

The most striking feature of the aspectual verb operators is their unique occurrence in only one of the two types of aspectual frame.

None of the above perfectivizing verbs seems to have any imperfective occurrences:

* For five minutes the man began speaking.
  (similarly for **stop**, **finish**, etc.)

In fact, all occurrences of these verbs including those where they do not function as operators (or rather, operator traces) have the same aspectual occurrence type and can be related to their operator occurrences in terms of zeroing and permutation, etc. For example:

John began opening the gifts.
John's opening of the gifts began.
John began his opening of the gifts.
all contain perfective occurrences of the verb *begin* and can all be related to one \( t(\text{begin}) \) \( \text{Ving} \) operation with differing paraphrastic operations. One such sequential derivation might be\(^1\):

\[
\begin{align*}
\text{John opened the gifts.} & \rightarrow \text{John's opening of the gifts began.} & \rightarrow \\
& & \phi_v(\text{begin}) \\
\text{John began his opening of the gifts.} & \rightarrow \text{John began opening the gifts.} & \phi_z^{-1} (\text{inverse of zeroing which drops subject}) & \phi_z (\text{on his...of})
\end{align*}
\]

Even occurrences which appear to act as other NNV verbs (*hit*, for example) as in \textbf{John began the race} turn out to be the resultants of operations on \textbf{John raced}, one of which is the \( t(\text{begin}) \) \( \text{Ving} \) operation.

A final comment on the scope or domain of the \textit{begin} operator is worth making here. \textit{Begin} and other perfectivizing operators can usually take perfective verbs in their domain of operation in addition to the imperfective operands. For \textbf{John began shooting} where the operand verb in this case is the perfective verb \textit{shoot}, the addition of modifiers for \textit{shooting} shows that there is an iterative implication:

\[
\begin{align*}
\text{John began his repeated shooting.} \\
\text{John began the period of time during which he shot repeatedly.}
\end{align*}
\]

This correlates well with the fact that such perfectives (without singular noun object) can be found in imperfective frames when in the -\textit{ing} nominalized form: \textbf{John's shooting lasted for quite a while}.

\[\text{C. Unrestricted imperfectivizing operators: *continue*, *keep*, etc.}\]

Most English verbs can be imperfectivized by one of the following operators:

\[\text{----------------------------------------} \]

\[\text{1} \text{See Harris, op. cit. for discussion of operator representations.}\]
continue:

** We listened to music before we continued eating dinner.
We listened to music before we ate dinner.

* Our continuing to watch the show occurred at some time.
* Our continuing to watch the show occurred suddenly.

keep:

* John waited until the gun kept going off.
* John suddenly kept walking.
(Since no -ing nominalization of the resultant form of the keep
operator occurs, we cannot test in the nominalized S frames.)

keep on:

** I knew Tom before he kept on sailing to Tahiti.
* Suddenly, John kept on reading.
* John's keeping on reading occurred unexpectedly.

go on:

** At last he went on singing.
* He went on talking at a particular time.

In a way analogous to the unrestricted perfectivizing operators, these
operators are also unambiguously determined in aspect. The im-
possibility of using the imperfectivizing operators in perfective frames:
in all occurrences of these verbs (even in apparently different usages)
points to their role in the language as perfectivizers and not simply
perfectively occurring verbs.

D. Negation

There is one additional operator which has all verbs in its
domain and which has the effect of imperfectivizing the verbal
occurrence of the operand by the criteria of the foregoing tests.
Since the determination of the scope of negation for conjunctions is
often difficult, it should be assumed that the description of negation
in these terms is highly tentative and perhaps merely a step on the way to a more effective description.

The existence of negated perfectives in imperfective frames is easy to verify:

John didn't arrive for four hours.
John didn't jump until the train stopped.

But some other tests are inconclusive:

? John's not arriving lasted for four hours.

To be sure, some negated perfectives occur in perfective frames:

The bomb didn't explode at 4:30.

But this is properly viewed as negation of the time predication which is the last operator applied before negation and thus this means negation on the entire sentence:

It is not the case that the bomb exploded at 4:30.
It was not at 4:30 that the bomb exploded.

Closer to verb negation is:

The bomb didn't explode for two weeks.

? The bomb's not exploding went on for two weeks.
Not for two weeks did the bomb explode.

Note that the form: *Not at 4:30 did the bomb explode does not exist. To further demonstrate that negation of perfectives gives imperfectives, consider the use of negated perfectives in perfective frames:

* Mary arrived before John didn't leave.
* The troops will stay until the situation doesn't improve.
* They arrived after the store hadn't closed.
The few bothersome examples, such as:

She sent for a doctor after John didn't respond to the treatment.

seem to be from zeroings of container phrases with verbs of cognition, e.g.;

She sent for a doctor after (she ascertained that (John didn't respond to the treatment)).

It also seems to be the case that negation on imperfectives gives imperfectives. For the usual frames, this does seem to be the case:

John didn't wait until the police came.
Mary didn't watch TV for ten days.
I didn't use the car until I finished the job.

The verb negations (perhaps to be described as conjunction negations) are respectively:

? Not until the police came did John wait.
Not for ten days did Mary watch TV.
Not until I finished the job did I use the car.

Of course the negations of the full sentences are also possible readings, ranging from preferred in the first sentence to non-preferred in the third.

The fact that negations on verbs seem to be unfailingly imperfective and the fact that verb strings with the imperfective operators continue, keep, keep on, go on are also unambiguous with respect to aspect may help explain why they are infrequently used together.

Consider the following:
(?) John didn't keep on shooting after the war ended.
(?) Sue continued not smoking until the data were falsified.
(?) They didn't go on talking until the curfew bell rang.

For use in this imperfective frame the negation alone suffices:

John didn't shoot after the war ended.
Sue didn't smoke until the data were falsified.
They didn't talk until the curfew bell rang. (didn't stressed)

E. Restricted Perfectivizing Operators

Besides the unrestricted operators which have in their domains essentially all verbs of the language, there are many verb operators which act only on small subclasses of verbs giving resultants in the form of a nominal related to the operand verb as the object of some common verb such as make, take, do, give, and (marginally) have, etc. Since most of these operator verbs have perfective occurrences in their usage as NVN verbs, the effect of the operator is frequently to perfectivize the operand verb. For example:

I talked with John for three hours.
? I had a talk with John for three hours.
(but I had a three-hour talk with John.)

and in the frame with conjunction:

I talked with John until the train came.
? I had a talk with John until the train came.

Almost always the resultant is unambiguously perfective (as is supported by these examples) although imperfectivizing operators may be applied on them, e.g., I continued to have talks with John
until we agreed to co-operate.

Certain frequently used verbs of motion all undergo several similar perfectivizing operations:

\[ V_m \rightarrow \text{take a } (V_m)_n \]
\[ V_m \rightarrow \text{go for a } (V_m)_n \]
\[ V_m \rightarrow \text{have a } (V_m)_n \]
\[ V_m \rightarrow \text{go } (V_m)\text{ing} \]

where \[ V_m \in \{ \text{walk, run, swim, drive, sail, hike, jog, ride, stroll, fly, ... } \} \]

and customarily \((V_m)_n = V_m\) (exception: fly, flight). The perfectivizing operations on the verbs of motion seem to have little other effect than the perfectivizing of their operand verbs. That is to say, all changes in the co-occurrence in the resultant correlate with the differences in the two kinds of aspectual frames.

Some additional perfectivizing verb operators have even more specific domains. In many cases, particularly where the \(V\) has a singular noun as object, the operand verb and the resultant are both perfective so that the two forms are essentially paraphrases:

He checked his bearings.
He made a check of his bearings.

Some representative operator constructions are:

John grinned.
John broke into a grin.

John restricted the operation.
John put a restriction on the operation.
John sniffed the perfume.
John took a sniff of the perfume.

John analyzed the drug's composition.
John made an analysis of the drug's composition.

John responded to the inquiry.
John made a response to the inquiry.

A more detailed listing (necessarily fragmentary) is given on the following pages. For many verbs, there is an appropriate, and usually highly specific, verb which can nominalize (and perfectivize) the original verb:

\[ N_1 \text{ fine } N_2 \text{ N}_3 \text{ (amount of money)} \quad N_1 \text{ slap a fine of } N_3 \text{ on } N_2 \]

\[ N_1 \text{ tax } N_2 \quad N_1 \text{ levy a tax on } N_2 \]

For such cases, there is less interest in listing the operator verb, although most such cases act to perfectivize and may be productive on 'semantically similar' verbs.
RESTRICTED PERFECTIVIZING OPERATORS

[\text{speak}] \rightarrow \{\text{make}, \text{give}, \text{deliver}\} \quad \text{a} \quad \{\text{speech}, \text{report}, \text{talk}, \text{lecture}\}

\begin{align*}
\text{breathe} & \quad \text{sniff} \\
\text{gulp} & \quad \text{whiff}
\end{align*}
\rightarrow \quad \{\text{take}, \text{have}, \text{get}\} \quad \text{a} \quad \{\text{breath}, \text{sniff}, \text{gulp}, \text{whiff}\} \quad \text{of} \quad N

\begin{align*}
\text{respond to} & \quad \text{answer} \\
\text{reply to} & \quad \text{give} \quad N \quad \text{a(n)} \quad \{\text{response}, \text{answer}, \text{reply}\}
\end{align*}

\begin{align*}
\text{require} & \quad \text{obligate} \\
\text{restrict} & \quad \text{limit}
\end{align*}
\rightarrow \quad \{\text{place}, \text{put}, \text{set}\} \quad \text{N under} \quad \{\text{an obligation}, \text{to} \quad V\underline{n}, \text{the restriction}, \text{the limitation}\} \quad \text{that} \quad NV\underline{n}

\begin{align*}
\text{study} & \quad \text{survey} \\
\text{count} & \quad \text{measure} \\
\text{observe} & \quad \text{describe} \\
\text{check} & \quad \text{evaluate} \\
\text{read (instrum.)} & \quad \text{record} \\
\text{determine} & \quad \text{calculate} \\
\text{calibrate} & \quad \text{assess} \\
\text{sample} & \quad \text{analyze} \\
\text{enumerate}
\end{align*}
\rightarrow \quad \{\text{make}, \text{a(n)}\} \quad \text{do}

\begin{align*}
\text{study} & \quad \text{survey} \\
\text{count} & \quad \text{measurement} \\
\text{observation} & \quad \text{description} \\
\text{check} & \quad \text{evaluation} \\
\text{reading} & \quad \text{recording} \\
\text{determination} & \quad \text{calculation} \\
\text{calibration} & \quad \text{assessment} \\
\text{sampling} & \quad \text{analysis} \\
\text{enumeration}
\end{align*}
RESTRICTED PERFECTIVIZING OPERATORS
(continued)

[understand
believe
think
suspect
feel
regret] that S \rightarrow \text{come to} [understand
believe
think
suspect
feel
regret] that S

[admir
respect
recognize] N \rightarrow \text{come to} [admir
respect
recognize] N

appreciate the fact that S \rightarrow \text{come to appreciate the fact that S}

[realize
conclude] that S \rightarrow \text{come to the} [realization
conclusion] that S

[know
like
understand] N \rightarrow \text{get to} [know
like
understand] N

feel that S \rightarrow \text{get to feeling that S}

[kick
shove
whack
look at
(perfectives)] N \rightarrow \text{give N a} [kick
shove
whack
look]

talk to
thrash
scold
(imperfect.)

N \rightarrow \text{give N a} [talking - to
thrashing
scolding]

[fast
diet
rampage
crusade] \rightarrow \text{go on a} [fast
diet
rampage
crusade]
V. Prepositional Operators

A. Prepositions as traces of perfectivizing operations

It is impossible to test a large number of sentences with regard to their aspectual occurrences without concluding that prepositions of a certain kind play an important part in determining these occurrences. Of special interest are stressed, separable prepositions, i.e., those which may, for transitive verbs, permute with the object noun phrase when this phrase is relatively short. This typically occurs when the object is a pronoun. For example:

John used up the paint.
John used the paint up.

are paraphrases replaceable by John used it up when the referent it is unambiguous. The preposition up receives stress at least equal to that on used. For separated occurrences the stress on the preposition is usually greater and the preposition is followed by a juncture or marked by an intonation phoneme. It is therefore possible to distinguish cases of stressed, separable P (for transitive verbs) from several kinds of similar prepositional and adverbial usages. For example:

John dashed up the road. (unstressed and inseparable preposition)
* John dashed the road up.
* John dashed it up.

and:
I asked her over.
(cf.?I asked over the lady we met last night.)
For the second pair of examples, the analogy is close and may be gaining in acceptability. Normally, however, the unzeroed form is used: I asked the lady we met last night to come over. There are also pseudo-separable cases such as:

We finally saw the guests off.
? We finally saw off the guests.

Since the paraphrase We finally saw that the guests got off is an unzeroed form representing a source different from the one to be proposed later in this chapter, it is reasonable to exclude these cases from the discussion. There are also anomalous verbs such as own up which do not behave like other stressed, separable VP.

This may be related to the fact that they require an additional P before the object N. For example:

Mike owned up to the foul deed.
Mike owned up to it.
* Mike owned to it up.
* Mike owned to the foul deed up.

Normally a form like the one in the second example, where the pronoun is the final element, is not possible for stressed, separable P, e.g., * John beat up him).

Many verbs do not occur with stressed, separable P. For some of these V, this non-occurrence seems related to the structure of their verb complements. Some general characterization of these V will be given in section C of this chapter.

For those V which do take stressed, separable P, many seem
to be perfectivized as a result of the operation, i.e., the aspectual occurrence of VP can only be perfective whereas V has imperfective occurrences (see p. 78 for examples). For each V there are often several P which perfectivize it, each with a different semantic effect in terms of the paraphrases of the resultant:

John turned up the volume.
John turned down the offer.
John turned off the electricity.
John turned away the last six applicants.
John turned on the light.
John turned over.

Certain perfective frames, including $\text{\small{(}V_n\text{)}}$ was done by John,$^1$ identify these sentences as occurring perfectly. In particular, none of the above six sentences fit naturally into the frame of $S_1$ preceding until, except with the addition of some imperfectivizing operation such as $t(\text{keep})$.

It is not true that all simple NVN verbs have imperfective interpretations while the corresponding VP all have perfective interpretations. Many V have perfective occurrences also. For example:

The wounded man suddenly died.
The children broke the Ming vase at a particular time.
The guard locked the gate at 10 p.m.

Let us compare these sentences with some corresponding forms

$^1$I am indebted to Henry Hizi for the suggestion of this frame.
Perfectivizing Effect of Stressed, Separable P in VP

<table>
<thead>
<tr>
<th>V in imperfective frame</th>
<th>*VP in imperfective frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>John wore his brown suit until the buttons came off.</td>
<td>*John wore out his brown suit until $s_2$.</td>
</tr>
<tr>
<td>Mary used Sue's toothpaste until she found out about it.</td>
<td>*Mary used up Sue's toothpaste until $s_2$.</td>
</tr>
<tr>
<td>The horse drank the water until his belly was round.</td>
<td>*The horse drank up the water until $s_2$.</td>
</tr>
<tr>
<td>The chef cooked the meat until it was tender.</td>
<td>*The chef cooked up the meat until $s_2$.</td>
</tr>
<tr>
<td>We dragged the box until we came to a clearing.</td>
<td>*We dragged off the box until $s_2$.</td>
</tr>
<tr>
<td>John beat his little brother until his father came in.</td>
<td>*John beat up his little brother until $s_2$.</td>
</tr>
<tr>
<td>The sailor scrubbed the deck until it was clean.</td>
<td>*The sailor scrubbed down the deck until $s_2$.</td>
</tr>
<tr>
<td>She tore the dress until it was ruined.</td>
<td>*She tore up the dress until $s_2$.</td>
</tr>
<tr>
<td>The operator rang his number until he answered.</td>
<td>*The operator rang up his number until $s_2$.</td>
</tr>
<tr>
<td>He counted the sheep until he went to sleep.</td>
<td>*He counted up the sheep until $s_2$.</td>
</tr>
<tr>
<td>He shook the bottle until all the sediment disappeared.</td>
<td>*He shook up the bottle until $s_2$.</td>
</tr>
<tr>
<td>He slurped his soup until the waiter complained.</td>
<td>*He slurped up his soup until $s_2$.</td>
</tr>
</tbody>
</table>
which use prepositional operators:

* The wounded man died out suddenly.
  The children broke up the Ming vase at a certain time.
? The guard locked up the gate at 10 p.m.

In general the last three sentences differ from their counterparts either in acceptability or appropriateness of certain adverbial modifiers. It seems that for V which generally have perfective occurrences by themselves, the VP occurs with process modifiers, e.g., step by step. The occurrence of these VP with human or animate subject is often accompanied by modifiers such as deliberately, on purpose, etc. and not with modifiers such as accidently, by chance. For example:

The children broke the vase accidently.
?* The children broke up the vase accidently.

and: *I broke that old chair for firewood.
I broke up that old chair for firewood.

The usage of break here is analogous to that of a certain class of verbs such as use, tear, cut, shake, tighten, etc. in that it meets the following condition: When V and stressed, separable VP take the same subject-object noun pairs the following sentence is usually a paraphrase of VPN: VPN by a process of repeated Ving.

Consider the following paraphrase pairs:

\[2\] For the suggestion of this test modifier I am indebted to Henry Hiž.
The children broke up the vase.
The children broke up the vase by a process of repeated breaking.

He locked up the house.
He locked up the house by a process of repeated locking (of doors and windows).

He cut up the meat.
He cut up the meat by a process of repeated cutting.

He tightened up the cable.
He tightened up the cable by a process of continuous tightening.

She wiped up the spill.
She wiped up the spill by a process of continuous wiping.

For just this set of V we have the possible application of the verb operator keep with the addition of repeatedly when NVN is perfective and continuously when NVN occurs imperfectively.

As the previous examples and the lists on pp. 81-82 indicate, up is the most frequently appearing operator. Except for cases where the notion of direction is clear, as in blow up, stand up, stack up, the preposition up seems to serve a general, abstract, and relatively productive function as perfectivizer:

He's all spruced up.
She's all dolled up.
That really messed up my plans.
That grease will clog up the sink.
The cashier rang up the bill.
He scrounged up the money.

It is significant for the discussion of the sources (in terms of
PREPOSITIONAL OPERATORS
(a partial listing)

possible VP (domain may vary)

V

eat N  eat up N, eat out N
drink N  drink up, drink down N
drink N  drink up
use N  use up N
wear N  wear out N, wear off N, wear down N
wear N  wear out, wear off
speak N  speak up, speak out
?talk N  talk up N, talk out N, talk down N, talk over N, talk through N

tighten N  tighten up N
loosen N  loosen up N
sharpen N  sharpen up N
soften N  soften up N
brighten N  brighten up N
frighten N  frighten off N, frighten away N
scare N  scare off N, scare away N
work N  work out N, work up N, work off N
work N  work out
sew N  sew up N, sew on N
tear N  tear up N, tear out N, tear off N, tear down N, tear away N
cut N  cut up N, cut out N, cut off N, cut down N, cut away N
break N  break up N, break out N, break off N, break in N, break down N, break away N
break N  break up, break out, break off, break in, break down, break away, break through
shake N  shake up N, shake out N, shake off N, shake down N,
slow N  slow up N, slow down N
? speed N  speed up N, (*speed down N)
block N  block up N, block out N, block off N
lock N  lock up N, lock out N, lock in N
live N  live out N, live down N
stand N  stand up
sit N  sit up, sit down
die N  die off
turn N  turn up N, turn out N, turn off N, turn on N, turn in N,
      turn down N, turn away N, turn around N,
      turn over N, turn under N
turn N  turn up, turn out, turn off, turn on, turn in, turn away,
      turn around, turn over
PREPOSITIONAL OPERATORS (continued)

V possible VP (domain may vary)

open N open up N
open open up
pass N pass up N, pass out N, pass off N, pass on N, pass by N, pass around N, pass through N, pass over N
pass pass out, pass on, pass by, pass through, pass over
try N try out N, try on N
try try out
help N +? help out N
fold N fold up N, fold out N
fold fold out, fold up
blow N blow up N, blow out N, blow off N, blow down N, blow away N, blow over N
blow blow up, blow out, blow off, blow down, blow away,
         blow over
act act up, act out
count N count up N, count out N, count off N
wipe N wipe up N, wipe out N, wipe off N, wipe away N
fake N fake out N
buy N buy up N, buy out N, buy off N
sell N sell out N, sell off N
wring N wring out N
bring N bring up N, bring out N, bring off N, bring in N, bring over N, bring around N, bring through N
heat N heat up N
cool N cool off N, cool down N
pump N pump up N, pump out N, pump off N
clear N clear up N, clear out N, clear off N, clear away N
clean N clean up N, clean out N, clean off N, clean away N
take N take up N, take out N, take off N, take in N, take over N, take away N, take down N, take on N
make N make up N, make out N, make over N
operators) that up alone often functions as a predicate meaning finished:

Your time is up.
The jig is up.

B. Characterizing VP

It may be quite revealing to examine fairly extensive lists of the verbs which do take stressed, separable prepositions as operators on them to understand more exactly the extent of this class of operators, as well as the possible domain of operation for such an operator. Certainly the description of VP as a class is related to certain historical processes in the development of (American) English. The bulk of the V which take P-operators are monosyllabic Germanic-root verbs, although finish up, polish off, divide up indicate that this is not a satisfactory characterization. In addition there is the problem of specifying which monosyllabic Germanic root verbs do not have VP forms. Moreover, certain intransitive verbs (e.g., pass out, die out) seem to exhibit similar distributional properties, but since the separable property depends on permutation with an object pronoun, this defining test is not possible. For a large number of intransitive occurrences (e.g., The barn burned down, The ship broke up on the rocks) the VP can be derived from a corresponding transitive form by zeroing of an indefinite subject (cf. Someone burned the barn down, Something broke up the ship on the rocks or The rocks broke up the
ship). Since the bulk of intransitives seem to be derivable in this way from transitive VP (notable exceptions: die, speak), this may prove to be an efficient way of representing all intransitive VP in an operator algebra representation of language.

Returning to the question of characterizing which monosyllabic Germanic-root verbs do not undergo P-operations, we note that smile, laugh, grin, flee, and other possible candidates for the perfectivizing P-operation show only weak tendency to appear as VP forms. Since some of these verbs are reflexive in other IE languages (cf. Polish: śmiać się=laugh, uśmiechnąć się=smile) the representation of intransitive VP as coming from transitive VP by zeroing would also characterize this part of the set *VP. Presumably, a new usage of one of these verbs as transitive would soon be accompanied by an intransitive VP if the new usage permitted the subject to be indefinite. The recent usage of laugh off and laugh down are examples.

C. Some Comments on *VP

The set *VP of verbs which do not have an occurrence with stressed, separable P is interesting as such only for what clues can be gotten for the decisions about operator domains and order of operations. Assuming that new formations are usually monosyllabic on analogy to the bulk of the VP, it is revealing only to look at monosyllabic members of *VP. Like, love, own, wish, want are
all stative verbs which do not undergo the t(be) Ving operation. Since these verbs are also difficult to perfectivize with the productive perfectivizing operators, it is not surprising that they do not undergo P-perfectivizing. One says I don't like him any more rather than ? I've stopped liking him or*I finished liking him. The only occurrence of statives with perfectives seems to be certain devious and special forms: She fell in love with him, I came to like her.

Since both want and wish are at least marginally in the operand set of begin and stop, we must appeal to another set of facts to account for the non-existence of want up, wish up, etc. The fact is that in general no verbs which act as containers show any co-occurrence with prepositional operators. In general, no verbs occurring with complex objects, such as NVVPN, NV(S)ₙ (container verbs), NV that S, or double container verbs like cause are in the domain of any P-operation. Presumably these complex objects make the permutation complex or do not enter the domain of other operations which may turn out to be integrally related to the permutation of stressed, separable P. In general, then, the existing VP are all characterized by simple NVN transitive occurrences (with arbitrary adjunction of noun modifiers) or zeroings of these forms of the following kind:

\[ \text{NVPN}_2 \rightarrow \text{*VPN}_2 \rightarrow N_2\text{VP} \quad \text{for } N_1 \text{ indefinite (e.g., The barn burned down)} \]
or: \( N_1 \overline{VP} N_2 \rightarrow N_1 \overline{VP} \) for certain indefinite \( N_2 \) (e.g., \( \text{John drank up.} \))

**D. Imperative and Negative Imperative on Aspectual Operators**

Now that the basic types of aspectual operators for English have been presented, we may look for the manifestation of the analog of a phenomenon in Polish. We recall from the description of Polish aspect in section III.A. that with negated commands in Polish the imperfective form of the verb is more frequent and that the perfective form is somewhat more frequent for non-negated commands.

For English, there may well be an analog to this feature in Polish, but it is pronounced only for the fully productive operators and very weakly or not at all for the prepositional operators.

For the productive aspectual operators, consider the relative acceptability of negated commands with and without the perfectivizing operators:

- Don't run in those shoes!
- ?Don't take a run in those shoes!
- ?Don't go for a run in those shoes!

Likewise for other productive operators:

- Don't look at the sun!
- *Don't take a look at the sun!

And for some other operators which are clearly perfectivizing:
Don't joke about that!
Don't tell a joke about that!
(However: Don't tell jokes about that!)

For the prepositional operators which seem to affect very little other than the co-occurrence distribution related to aspect (e.g., shine, shine up), there are many cases where the negative perfective is definitely less acceptable than the negative perfective, i.e.

Don't VP! is definitely less acceptable than Don't V! For example:

Shine up these shoes!
? Don't shine up these shoes!

(?) Shine these shoes!

Don't shine these shoes!

However, there seem to be at least as many verbs for which there is virtually no preferred form:

Open that box!
Don't open that box!

Open up that box!
Don't open up that box!

Thus for the prepositional operators the effect, if any, is too small or irregular to be described at this point. More information is needed about the varying scope of negation in particular.

E. Possible Operator Sources for VP

Among the verbs which take stressed, separable P as operators there is a small group, let us call them V_i, which are basically imperfective in that N_1 V_i N_2 usually occurs imperfectively according to the various tests proposed. The verbs of V_i are to be distinguished from other verbs which may be used easily in either frame. Thus a verb like use is differentiated from a verb such as
**eat:**

John used Bill's pencil for a few minutes.

*John ate an apple for a few minutes.

John used Bill's pencil until it broke.

* ? John ate an apple until the bell rang.

A verb of \( V_i \) is characterized by its imperfective occurrence even when the object is a singular noun. Note that \( \textit{eat} \) can become imperfective when the object is an indefinite or definite plural noun or a mass noun (in certain cases):

John ate apples for awhile.

John ate (things) until he became full.

John ate tree bark until spring came.

The verbs \( V_i \) which act like \( \textit{use} \) form a relatively small group containing: \( \textit{use, help, wear, turn, shake, walk, etc.} \) For \( V_i P \) there is almost always a perfective occurrence although the domain of noun pairs may change:

We will use your name in the reference.

* We will use up your name in the reference.

For those \( V_i P \) that do occur, a paraphrase may often be given as:

\[
N_1 V_i P N_2 \leftarrow N_1 V_i N_2 \quad \text{until} \quad (N_1 V_i N_2)_n \quad \text{t(be) complete.}
\]

In a way that is somewhat more marginal, this form paraphrases the perfectly occurring \( V \) as well, but with the reading that

\[
N_1 \ t(\text{keep}) Ving \ N_2 \quad \text{until} \quad (N_1 V_i N_2)_n \quad \text{t(be) complete.}
\]

Thus in describing English structure, it may be possible to replace
the problem of describing VP forms (for stressed, separable P) with the problem of describing certain $S_1C_tS_2$ forms where the P does not appear in either $S_1$ or $S_2$. More likely, however, a simpler operator source is possible. For many occurrences we get NVP$n$ replaceable by NV$n$to completion or (NV$n$) t(be) to completion. Since the fact is that many perfectivizing P change the meaning (i.e., co-occurrence restrictions) of the V in ways other than the aspectual deformation there may be serious limits as to how adequate a single source will be.

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3. The suggestion of this kind of operation was made by Zellig Harris in a conversation.
VI. Tense, Aspect, and Adverbial Time Expressions

A. Types of Adverbial Time Expressions

Any decision made about the operator representation of tense and aspectual occurrence must ultimately take into account the variety of adverbial time expressions which accompany the aspectual occurrences as well as the possibility of their occurrence in conjoined sentences. As we have indicated, there are limitations on the kind of time expressions that can be added to a $S_1 C S_2$, and, of course, these limitations are related to the particular aspect (partially because of the definition of aspect through co-occurrence tests). In preparation for a brief discussion of the problem, let us name and describe several varieties of adverbial time expressions (where this term covers adverbs like tomorrow and more complex modifiers such as at three, on the fifteenth, in March and many others).

1. bin location

The past and future tense markers act as classifiers of two categories of time expressions (called bin location and point location expressions) between which there is no well-defined borderline. In terms of their mutual co-occurrence, they behave in a readily describable way. Expressions of bin location (e.g., tomorrow, last night, in November, etc.) serve (perhaps successively) to delimit other bin locations or point location expressions. In On March
15th, 1967, at 3 a.m., the bomb exploded, the successive (nested) bin location expressions are 1967, March, 15th, a.m. Each bin location expression has two point location expressions associated with it as beginning and end, as indicated by usage of sentences like When tomorrow ends (at midnight) she'll be far away, At the beginning of 1967 the country awakened.

2. point location

Although most S do not contain an explicit expression of point location (e.g., at that time, now, at noon, etc.), the tense marker also classifies any point location expressions which may occur, consistently, needless to say, with the bin location expressions. It is significant that many C_t form point location expressions with following S and their corresponding P_t form such expressions with nominal phrases (e.g., when they dropped the bomb, as we crossed the street). For the time being, we can exclude these from the discussion. A defining property of a point expression is one which cannot be further delimited. For one verb occurrence in a sentence there may be several bin location expressions, but never more than one point location expression without giving appositive reading to the sentence.

3. duration

Expressions such as for three days, all day long, etc. are not expressly classified by the tense markers, but normally occur
consistent with the bin location expressions which may be present, e.g.:

* All day last month we watched TV.
  We slept all day Thursday.

Likewise there are restrictions against point and duration expressions occurring with the same verb:

* All day long at four o'clock we read.
  * For three hours at that time we played bridge.

4. iteration

Expressions such as **times**, **twice**, etc. are classified as iteration expressions and do not normally occur with the **Ving** operation and cannot occur in the same sentence (excepting under container verbs) as duration expressions. Note:

? For four hours I sat there three times.
? I was talking to him twice.

There may be some exception for **once** which does occur in:

Once I talked to him for five hours.

5. customary time

The form of the simple present tense, besides serving as the regular present for container and stative verbs, normally has several usages including "customary time": **He eats three meals every day**, **He usually gets there before I do**. Customary time expressions can take forms such as **every Tuesday**, **seldom**, **always**, **never**, **rarely**, etc. Although there is undoubtedly a whole new set
of problems involved in a detailed description of these constructions used with general tense, they are not integrally related to the description of tensed constructions except in their similarity of source. This feature will be considered briefly in section C below.

B. Redundancy and Apposition in Modifying $S_1 C_t S_2$

Let us look at some pairs of sentences of the form $S_1 C_t S_2$ with and without the addition of certain time expressions:

John came before Mary left.  
John came at 5 p.m. before Mary left.

John read until the sun set.  
John read for four hours until the sun set.

He phoned the library while she was doing the dishes.  
He phoned the library at 7 p.m. while she was doing the dishes.

For the imperfective $S_1$ in the second pair, the addition of an expression of time duration seems to change the intonation and reading of the $C_t S_2$, giving it a sense of apposition (comma required) such that it is paraphrasable by two sentences:

John read until the sun set.  John read for four hours. Likewise for the first and third pairs, the perfective verb with both definite point location time expression and $C_t S_2$ seems slightly less acceptable and has a strongly appositive reading. Similarly for the $S_2$, added time expressions contribute to a particular kind of redundancy bordering on unacceptability:
(?) John came before Mary left at 5 p.m.
(?) John read until the sun set at 7.
(?) We waited until John came, just a few minutes ago.

To regularize these appositive expressions we would need the addition of the time at which immediately following the $C_t$, and which $t$(be) just before the added $D_t$. In each case, then, the sentence $(S_2)_n^\text{t}(be) D_t$ could be recovered from the non-restrictive relative clause by established transformational procedures.

C. General Present Tense with $C_t$

A further word is in order regarding general tense expressions such as:

Max kisses his wife before he leaves for work.
The lion waits until his prey starts to feed.

Since the modifiers for general tense sentences can frequently appear as predicate adjectives, e.g.,

Max's kissing his wife before he leaves for work is usual.
The lion's waiting until his prey starts to feed is rare.

there seems to be motivation for considering these modifiers as instances of a sentence operation which has been applied after the conjunction operation (in the operator representation). This is quite analogous to the introduction of tenses by means of single operators on $S_1 C_t S_2$ forms which is possible as a consequence of the single tense hypothesis. Whereas the tense operation allows the operation of other time expressions subsequently, they must be the kind of
definite time expressions compatible with that tense. For strings with no tense operation, the operation of general tense modifiers can be carried out. A consequence of this view is that $S_1$ and $S_2$ do not have any independent time expressions in them, but that all time expressions for $S_1 \cup S_2$ expressions are predicated of the conjoined string. No attempt to investigate this has been made as yet.
VII. Special Problems with \texttt{t(have) Ven} and \texttt{t(be) Ving} Operations

1. \texttt{have Ven} allows addition of \texttt{since}

In dealing with the operator traces which remain in $S_1$ or $S_2$ when the common tense is factored out of the operator representation (however we may care to formulate this) a number of residual problems arise. One would like to know to what extent the traces of the \texttt{t(have) Ven} and \texttt{t(be) Ving} operators are conditioned by the conjunction environment and just how the verb subcategory and other formally specifiable features interact to determine the specific structures which may occur. The discussion of the deviant appearance of the \texttt{have}-operator trace before most $C_t$ can be referred to chapter II where we paraphrased, e.g.:

John has (on occasion) waited until Mary arrived.
It has happened that John waited until Mary arrived

showing that there is conformity of tense morphemes under the operator: \texttt{t(have) Ven}.

The function of the \texttt{have}-operation with \texttt{since} has already been touched on in III. B. 3. In particular, there seems to be a lack of the \texttt{have} trace without additional modifiers when the sentence is paraphrased by adding \texttt{on one occasion} (i.e., the marginal acceptability is preserved in the paraphrase:

\begin{quote}
He has gone to New York.
He has gone to New York on one occasion.
\end{quote}

For the types of adverbial time expressions described in chapter VI,
the expressions of duration, point location, and bin location rarely occur with the have-operation except with iteration expressions. With both have and be as operators we may have duration expressions:

You've been reading that book for a whole hour.
? You've read that book for a whole hour.  (with duration)

? You've opened the door at 8 p.m.  (with point location)
? You've opened the door today.  (with bin location)

but: You've opened the door three times today.

Certain adverbs (e.g., just, already) may suffice with these perfections to raise the acceptability to near normal. But basically the "stock-taking" function of the have-operator indicates co-occurrence with iteration adverbs of number (e.g., twice) or the progressive sense of the t(be) Ving operation:

I've eaten there twice this week.
I've been eating there this week.
He's been working there for seven years.

Although since generally occurs with the have-operator, not all occurrences of t(have) Ven are accompanied by since $S_2$:

You've just won a prize.
* You've just won a prize since $S_2$.

This seems particularly true when bin location expressions have been added:

* I've eaten there twice this week since $S_2$
? I've been eating there this week since $S_2$
? You've won three prizes today since $S_2$
2. had Ven often allows replacement with before $S_0$ (past tense)

Although had Ven is in many ways analogous to the corresponding present tense form, its occurrence with past tense allows a regularization using before which is not possible with present due to the impossibility of ordering now-present tense statements. In general, had Ven occurs only when there is an occurrence of past tense in the immediate discourse environment. This is difficult to show since the agreement on acceptability of discourses is not as good a datum as the agreement on acceptability of sentences. But using a certain regularization with $C_t$, this hypothesis may be checked.¹

We claim that had Ven is an abbreviation for the metalinguistic ordering of two past tense statements. Thus:

John said he had (just) seen a flying saucer.
John saw a flying saucer (just) before he said, "I saw a flying saucer".

John was feeling bad. He had just eaten his sister's cake.
John ate his sister's cake just before he was feeling bad.

John had packed a lunch before he left home.
John packed a lunch before he left home (and this was before $S_0$).

In general, there is a close analogy between regularization to before $S_0$ (past tense) and regularizing have Ven to (S) is by now proposed by Harris¹ or an analogous $S$(past) before now.

3. effect of had Ven on $S_2$

The trace of had Ven seems to be eliminable in many cases by

¹These procedures were communicated by Harris in public and private discussion.
the paraphrase suggested in the previous section. For \textit{had Ven} in \textit{S_2}, however, the mechanism does not seem to be the same.

With the exception of \textit{after}, \textit{had Ven} does not seem to occur in \textit{S_2} without occurring in \textit{S_1}, in which case the single regularization as for \textit{S_1} alone has the same effect. For \textit{after}, \textit{had Ven} in \textit{S_2} alone seems to be slightly preferable in some cases to the simple past form (i.e., "past") although this may be related to the need for excluding causal interpretations which \textit{after} sometimes gives. In cases where the difference seems substantial, we can often substitute \textit{S_2} before \textit{S_1} as a paraphrase up to presupposition.

4. Adverbial Co-occurrences with $t(be)$ Ving

There seems to be some promise of finding more exactly which adverbs co-occur with the be-operator trace by using the tests developed for aspect in this work. We note that with point time expressions the operation is quite natural:

John is mowing the lawn now.
John was swimming when I came into the backyard.

In addition, the more refined perfective tests do not work:

* John was suddenly swimming.
* John's being in the process of swimming occurred at some time.

In general, the operator behaves as an imperfectively occurring verb and operates on perfectives, so that it acts somewhat like an imperfectivizing operator. Further study of the relationships with while and as may prove fruitful.
VIII. Interaction of $S_1 C_t S_2$ with Performatives

A. Imperatives

A frequent occurrence of $C_t$ is under imperatives in expressions like: Look before you leap! and Don't fire until you see the whites of their eyes! In the view of Harris and, more recently, others, imperatives and questions may be represented as resultants of the zeroing of performative container strings. In this view, the above two commands would be represented by the following source in terms of operators:

I request (of) you that you look before you leap.
I command (of) you that you not fire until you see the whites of their eyes.

With the zeroing of the container there is also a zeroing of the second person pronoun you.

Two additional comments will be made here in view of the claims being made about tense and aspect in the preceding chapters. The first regards the tense of the operand string under the imperative container operator. As was argued in chapter II, the appearance of present tense in the $S_2$ in the presence of a conjunction $C_t$ such as before is not possible except as a zeroed future tense. This implies that the tense for $S_1$ (i.e., the tense for the conjoined sentence as a whole) also be future. It is entirely reasonable that commands be

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formulated as present tense performative operations with verbs such as command and request and that these be restricted to domains of sentences on which the future tense is present. Thus in the operator system of Harris we would propose the following source representation of the first imperative construction above:

I request (of you) that (you will look before you will leap).

The reduction of the second will to zero phonemic form would precede the zeroing of I request (of you) that along with zeroing of you will and the morphophonemic addition of special intonation.

The second comment regards the particular support available for the zeroed performative representation on the basis of sentences such as Don’t shoot until you see the whites of their eyes. Note first that we do not have Shoot until you see the whites of their eyes! in the same context. (If necessary, shoot may be replaced by drop the bomb to bring out the perfectivity.) This would violate the imperfective frame before until. Rather, the sentence is produced regularly from:

I command (of) you that (you will not shoot until you will see the whites of their eyes).

Zeroing of the redundant second will and zeroing of the operator string plus you will leaves:

Not shoot until you see the whites of their eyes!
which a generalized morphophonemic operation takes to:

Don't shoot until you see the whites of their eyes!

A final comment about the non-occurrence of commands under \( C_t \) is in order. Because commands are represented as phonetically zeroed present tense operators, it follows that for those \( C_t \) which never take the now-present tense, no command could appear in an operand sentence under that \( C_t \). The fact that we do not get \underline{John came before watch out!} or other commands as \( S_2 \) or true \( S_1 \) is simply in harmony with the single tense hypothesis and the inequality ordering for \underline{before, after, since, and until}. For \underline{while, as and when}, the only occurrence of present tense seems to be the occasional use of \underline{while} with essentially durative \( S_2 \) and often \( S_1 \). Since the performative operator verb is not imperfective, it is not surprising that we do not get commands under \underline{while}. In any case, the use of conjunctions for present tenses seem to be extensions (except for general tense with present tense morpheme discussed in VI.C.) and not among their central functions.

B. Questions

The treatment of questions closely parallels that of commands in that they are derived from a performative \underline{ask}. But, unlike commands, questions are possible on any tense form and act to preserve that form in spite of other zeroings, permutations, and morphophonemic
changes. This is the reason why we have the $C_t$ since in questions but not in imperatives: imperatives must operate on a future tense and since never appears with future tense.

Harris asserts\(^2\) that questions requiring a yes-or-no answer are essentially double statements of the form:

I ask you whether $S$ or not $S$

An independent confirmation of this fact comes from the study of $C_t$. In particular, why do we not have:

*Didn't the bomb explode until the police arrived?

but we do have:

The bomb didn't explode until the police arrived?
You say the bomb didn't explode until the police arrived?
Did you say the bomb didn't explode until the police arrived?

as paraphrases. The non-occurrence of *Didn't the bomb explode until $S$\(^2\) can be explained from the non-occurrence of *The bomb exploded until the police arrived which violates the imperfective requirement for $S_1$ preceding until. The unzeroed source representation of the unacceptable question above is:

I ask (you) whether (the bomb didn't explode until the police arrived)
or (the bomb did explode until the police arrived).

The unacceptability of the second half of the question precludes the acceptability of the whole question or any form derived from it by

\(^2\)Harris, "Transformational Theory", pp. 391-392.
zeroing and permutation plus morphophonemic changes. The source of the askable (acceptable) form is reconstructable from the three listed paraphrases as:

I ask (you) whether you meant that the bomb didn't explode until said the police arrived
or you didn't say that (the bomb didn't explode mean until the police arrived)

Another (regular) paraphrase derivable from this source by zeroing, permutation, and morphophonemic change is the frequent:

Do you mean that the bomb didn't explode until the police arrived?

The fact that we have:

Didn't the bomb explode before the police arrived?

with before is consistent with the fact that both The bomb didn't explode before the police arrived and The bomb exploded before the police arrived are acceptable.
IX. Relative Position of $C_t$ in the Ordering of Transformations

A. $C_t$ Viewed as Binary Operation

Although there are strong reasons for classifying the operation $\mathcal{G}_{C_t}$ as a kind of unary operation, it is quite useful to view the conjunction of two sentences by a $C_t$ as a binary operation. Primarily, $C_t$ conjoins two sentence forms of parallel structure (i.e., NVΩ) where the types of adverbial time expressions which may be present are strictly limited. (It appears at this point that no such expressions may be present in the operand sentences). Virtually all instances of string types appearing before $C_t$ which cannot appear following it (e.g., the imperative VN structure) are the resultants of operations, usually of the class $\mathcal{G}_s$, which have been performed after the conjunction operation. This includes questions and imperatives which, according to the view taken here, do not appear in either $S_1$ or $S_2$ in the domain of the conjunction operation. The occurrence of any adverbial time expression as a modifier of just $S_1$ or $S_2$ (e.g., John waited until Mary arrived at 5 p.m.) is either added appositively, thus being equivalent to the adjunction of another sentence by means of zeroing part of a parallel co-ordinate form (e.g., John waited until Mary arrived and Mary arrived at 5 p.m.), or this occurrence is a modifier of the sentence as a whole and is thus the trace of a sentence operator whose application follows the conjunction operation, as in Yesterday (Max took a walk before he ate breakfast).
B. \( C_t \) Viewed as Unary Operator.

As Harris has suggested\(^1\) there are reasons for considering conjunction as a unary operation since the choice of \( S_2 \) given \( S_1 \) is not entirely free. This is particularly true for the subclass \( C_t \) of the class \( C_s \) of subordinating conjunctions, since the selection of \( S_1 \) restricts the choice of \( C_t \) depending on whether or not the verb of \( S_1 \) is imperfective or perfective in its occurrence, and given \( S_1 C_t \), the choice of \( S_2 \) is already determined with respect to tense and aspect as shown in the preceding chapters. As will be shown in section D below, there are also general restrictions on the form of \( S_2 \) such as to exclude \textit{it-} extractions and certain permutations which disturb the \textit{NV\#} form of the operand string.

From the study of \( C_t \) it seems clear that the \( C_t \) conjunction operation is in many ways analogous to the \textit{wh-} conjunction of relative clause formation. First of all, the sharing of a time adverb position (plus an ordering specification for some \( C_t \)) parallels the noun-sharing of the \( C_{wh-} \). In addition, the freedom of occurrence of the remaining sentence elements is of the same magnitude despite the difference in the domain of the selection restrictions. For example:

We met a man yesterday. The man owns a Ferrari.
We met a man who owns a Ferrari yesterday.

\(^1\) Harris, Mathematical Structures of Language, p. 104.
I laughed at a time. They showed me the picture at this time. I laughed when they showed me the picture. (cf. I laughed at the time at which they showed me the picture.)

Moreover, for certain logics, in both cases the structurally subordinated $S$ can be taken as a presupposition of the conjoined sentence and the $S_{1}$ has the force of assertion. Thus in the above set of examples both a man owns a Ferrari and They showed me the picture are presupposed by the conjoined sentences.

C. Operators Which May Act on $C_{t}$

1. $\mathcal{Q}_{S}$: Most types of $\mathcal{Q}_{S}$ seem to operate on sentences conjoined by $C_{t}$:

That John went to a bar before he returned home surprised Mary.

For him to quit before he gets his degree would be easy.
I doubt that Mary watched TV until Jack came home.
John decided that he will keep the apartment until he finds a house.
I asked him whether he came before the firetrucks arrived.

2. $\mathcal{Q}_{V}$: Some may operate, perhaps with intervening operators:

I've given up looking before I leap. (on general present tense)
He tried reading until he felt sleepy.

3. $\mathcal{Q}_{C}$: Most kinds of conjunction can operate on $C_{t}$ conjunction;

\[ \text{wh- conjunction} : \text{(provided that } C_{t} S_{1} \equiv D_{t} = \Omega) \]

I saw the man who hit John before I entered the building.

\[ \mathcal{Q}_{C_{\text{wh-}}} (S_{1} C_{t} S_{2}, S_{3}) \rightarrow S_{1} (\text{wh- } S_{3}) C_{t} S_{2} \]

The man whom I saw before I entered the building hit John.

\[ \mathcal{Q}_{C_{\text{wh-}}} (S_{3}, S_{1} C_{t} S_{2}) \rightarrow S_{3} (\text{wh- } S_{1} C_{t} S_{2}) \]

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*Keenan*, op. cit.
co-ordinate conjunctions:

Mary returned home when it got dark, but Jack didn't come back until he got hungry.

subordinate conjunctions:

John left before Mary came because he owed her five dollars.
Mary was angry because John left before she came.
I kept visiting Mary before I went to work until my colleagues complained.
I didn't see John until he came in with Mary after the party broke up.

4. Paraphrastic operations

A number of zeroings, pro-wordings, and permutation operations may follow conjunction by $C_t$. The most important permutation, perhaps, gives $C_tS_2$, $S_1$ from $S_1C_tS_2$, although there are some stylistic constraints governing order preference. Besides the zeroing of will in $S_2$, the usual zeroings and pronounings under conjunctions occur:

John will leave before Mary will.
I didn't see the man until you saw him.
I didn't see the man until you did.

D. Operators Which May Precede $C_t$

In general, $S_1$ and $S_2$ may have undergone any operations which leave a NVT structure, including the (kernel) form of It of It rained counted as N, but not the it of It was John who came;

John arrived before it started to rain.
* John arrived before it was Mary who left.
** Several minutes passed before it was John who emerged.
(note that It was John who worked until I came is the resultant of an it-extraction following the $C_t$ until)
Certain permutations (and perhaps all of them) are also excluded from the operand sentences:

   John winced when she chose this dog.
* John winced when this dog she chose.

Certain which have the effect of permutations are also excluded:

   John was angry when the fact that Mary was coming surprised Sue.
* John was angry when that Mary was coming surprised Sue.
X. Summary and Implications

A major goal of the work has been to specify as much as possible some necessary conditions that two sentences must meet to be conjoinable by $C_t$. After arguing on the basis of three separate phenomena that $S_1 C_t S_2$ sentences can be treated as one string under an operation of tense and that $S_1$ and $S_2$ cannot contain independent tense morphemes, we showed how some frequently used verb operators give resultants which have different aspectral occurrences, defined on the basis of co-occurrence with certain time expressions, from those of the operand verb. These operators, grouped in classes of unrestricted operators, restricted operators, and as a subclass of the latter, prepositional operators, have very restricted aspectral occurrences (except when occurring as operands of other aspectral operators) so that they may be described as perfectivizing or imperfectivizing operators depending on the unique occurrence type of their resultants.

In making a choice between representation of time conjunctions as binary or unary operations, the comparison with the $C_{wh}$ operation should prove fruitful. The operations in each case give resultants which share a word position, although in the case of the $C_t$, the only trace of this sharing is the $C_t$ itself. The operation of a single tense on $S_1 C_t S_2$ may prove to be an important factor in separating these $C_S$ from elements in the remainder set such as
because. Both causal subordinating conjunctions and the co-ordinating \( C_0 \) seem to be virtually free with regard to the tense dependency of the constituents.

If the regularization of the \( t(\text{have}) \) \textit{Ven} operation forms can be carried out along the lines mentioned for all cases despite the overlay of other subsequent operations, then the regularization of discourse with respect to time expressions will be enriched. It seems that tense might then prove to be representable as an operation over sections of discourse and that the changes in tense operations could serve as useful markers for the subsections of a discourse in some predictable way.

For Harris' algebra of operators, the work undertaken here gives support for the view that all time expressions arise from sentence operations. In particular it seems possible to generate sentence representations by sentential operators which leave a zeroable trace and which restricts the conjunction, adverbial modification, and tense operation of subsequent operators. There is no support for a view that tense is an operation on only a part of a sentence.

Perhaps the most significant result of the work here is the demonstration that aspect is a useful working construct in the formulation of grammar and that it correlates well with diverse features of the grammar in such a way that we may expect to simplify the description considerably through its use.