AN OUTLINE GRAMMAR OF THE ENGLISH *WHILE/WHEN/AS* TEMPORAL CLAUSES

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The aim of the present paper is to give a set of rules generating those temporal clauses in English whose sources are sentences embedded in the adverbial position by means of relativization. The term 'clause' is understood here in a sense broader than the traditional, so as to include not only strings like *when John finished reading* in *Mary left when John finished reading*, but also other elements which, as will be postulated, are transformationally related to such strings. Such elements are, for example, nominalizations or various strings containing participial expressions. The absolute construction will be discussed in greater detail here, but occasionally reference will be made to various other forms of time adverbials.

The traditional grammarians frequently pointed to the existence of certain connections between the members of sets like:

a. 1. When I saw it I left in a hurry.
   2. Seeing it I left in a hurry.
   3. Having seen it I left in a hurry.

or:

b. 4. When Joan was there we didn't dare to move.
   5. Joan being there we didn't dare to move.
   6. Joan there, we didn't dare to move.

Their observations, however, were chiefly made on the basis of semantic similarities and no or little attempt was made to relate the sentences formally. According to their outward form, the sentences would be distributed into different grammatical categories and treated separately. The traditionalists usually also commented on the ambiguity of sentences like 2, 3, 5, and 6, but tried to explain it by referring to the semantic contents of the two clauses which make up the complex sentence[1].

[1] For example, Jespersen (1965: 62) says: 'What meaning to ascribe to one particular nexus-tertiary very often depends on the particular meaning of the words combined

Transformational grammar did not deal with the problem of adverbials in English before Schwartz (1968). Earlier, only scattered remarks could be found in publications on other questions[2]. Still, there were studies describing clause adverbials in other languages: Hartung (1966) for German, Polański (1967) for Upper-Lusatian, and Nagucka (1968) for Middle English. The solutions given there will be drawn upon especially in the formation part of the grammar of adverbial clauses to be proposed here.

The following formation rules are considered necessary:

P1. S → NP Aux VP (Adv)
P2. Adv → Time, Cause, Condition, etc.
P3. Time → Ind NP
P4. Ind → sim, pre, seq, in, fin, etc.
P5. NP → { (Art) N (S) / NP S }

Irrelevant rules have been omitted. In particular, the VP is not further developed because the adverbials under discussion lie outside the VP[3]. Rule P2 allows the generation of various kinds of adverbials, one at a time, from the node Adv. Rule P3 implies that all time adverbials have the form Ind NP. This refers not only to clauses but also to simple adverbs of time. *Ind* is a cover symbol for the various types of time relationship occurring in sentences. *Sim*, *pre*, and *seq* of rule P4 stand for simultaneous, previous, and following, respectively; *in* denotes the beginning moment, *fin* denotes the final moment. Other types of relationship, e.g. duration, are also possible. It has proved more practical to employ the symbol *Ind* rather than to introduce the adverbials under the form of a prepositional phrase; the prepositions in the surface structure depend on the kind of temporal relation involved (*on Saturday* vs. *until Saturday*) and at the same time on the NP with which they occur (*on Saturday* vs. *in July*); moreover, for the purposes of semantic interpretation the features of time relationship (from now on the TR features) will have to be specified; it is better, therefore, to introduce prepositions only in the transformational part through a transformation operating on an NP possessing some TR feature. The right sides of rules P2 and P3 could be exchanged, should some evidence be found to the effect that other types of adverbials have the same structure as temporals. The symbol Ind would then be used for all types of

in it rather than on its grammatical form. Still we may broadly distinguish the following classes and in some instances give rules for their distinction". For a fuller discussion of various absolute constructions see also Curme (1931: 152 - 60, 275 - 7) and Jespersen (1965: 45 - 65).

[2] E. g. Chomsky (1965: 102 - 3), Harris (1965), Katz and Postal (1964: 127 ff).

[3] To be distinguished from the adverbials inside the VP, see Chomsky (1965: 102), Lakoff and Ross (1966).

adverbial relationship, and Rule P4 would have to be substituted by a series of rules analysing the particular types of adverbials. Since adverbials of time are the sole interest of this article the present formulation is sufficient here.

The set of phrase rules contains only one node Adv. This means that if a higher number of adverbials not dominated by VP occurs in the surface structure they must be the result of some transformational processes. The two possible sources are the conjoining of two or more sentences and relativization. Thus, for example, *John didn't like Mary in 1968 because she wasn't kind to him* (adverb of time followed by adverb of cause) comes from conjoining, whereas *John didn't like Mary in 1968, when she wasn't kind to him* results from relativization. Apparently, some limits can be put on this kind of relativization, but no similar restrictions on conjoining are conceivable. Any number of Adv nodes higher than one seems at present to be arbitrary.

Rule P5 follows the general solution for the development of NP's proposed by Rosenbaum (1967). The nouns occurring under the domination of Time must contain the feature +Time in the lexicon (such nouns as *day*, *Saturday*, *tomorrow*, *moment*, *time*)[4]. Some of them, such as *tomorrow*, *yesterday*, must be additionally specified as to the section of time (past, present, future) in order to avoid the generation of sentences like **He liked it tomorrow*. Obviously, time adverbials must be correlated with the tense of the verb. This ought to be effected in grammar by some sort of agreement rules. Rule P5 permits us to generate sentences containing time adverbials which have the form of a sentence. This is done in two ways. If the NP S variant is chosen, the sentence dominated by Time is introduced by means of relativization; if, on the other hand, the (Art) N (S) line is taken, the adverbial appears as a complement sentence. Relativization produces sentences like *John went to Honolulu when he was a boy* and *I turned away when I saw him*; a complement sentence is the source of *The robber escaped before the police came* and *He has been employing his brain since he came here*. The nouns preceding a complement S have to contain the feature +Pro. Such a noun would be realized in the surface structure as *that*, which existed in Middle English but must be deleted from a Modern English temporal clause. The NP S variant of the development of NP is the source of relative clauses, whose treatment here conforms to that given in Jacobs and Rosenbaum (1968: 199–212). It is this type of adverbials that will be subjected to more detailed examination.

The phrase structure rules for the generation of adverbials given above radically differ from the solution found in Schwartz (1968), where it is suggested

[4] *after the meeting* contains a noun which has not the feature +Time, but one of the claims of the phrase structure presented here is that such expressions come from full adverbial complement sentences. As the article deals mainly with the branch of rule P5 which develops an NP as NP S, the claim will not be further discussed.

that 'the major adverbial clause types (condition, concession, purpose, etc.) are basically adjunct to the subject noun' (Schwartz 1968: 747). Schwartz deals chiefly with the absolute constructions, both those containing participles and those without any verbal element. Connected with this claim about the phrase structure is another of his statements: 'As something of a tour de force, one can invent nominative absolutes that are susceptible of being interpreted in each of the major adverbial relations. But such "adverbials" are not to be taken as evidence for a syntactic categorization of absolutes: the point really is to accept the fundamental character of the absolute as a (syntactic) "neuter", and to regard so-called functions like cause, concession, etc. as semantic epiphenomena. If the absolute is viewed in this way, then it can be understood as the primitive clause of condition' (Schwartz 1968: 771). These conclusions are based, among other things, on the supposed paraphrase relation between sentences like:

7. Thompson, standing here next to me, is a fine man.
8. Standing here next to me, Thompson is a fine man.
9. Thompson is a fine man, standing here next to me[5].

Under one interpretation these sentences are indeed synonymous. But it is also possible to read sentences 8 and 9 as implying that Thompson is perhaps no longer a fine man when (if?) he does not stand here next to me (temporal-conditional interpretation). Such an interpretation is excluded in the case of sentence 7: Thompson is a fine man no matter whether he stands here next to me or not. This difference, as well as the differences between the particular readings of sentences 8 and 9, must be accounted for syntactically, and the only way of doing this is to postulate the existence of different underlying strings. Any other solution would entail profound changes in the semantic model worked out by Katz and Postal (1964). The 'transparency' Schwartz speaks of in this connection is not comparable to the partial ambiguity discovered in the well-known example of *Two languages are known by everybody in the room*[6]. The semantic ambivalence of many absolute constructions ought more correctly to be ascribed to their derivation from different sources. It decreases when we have to deal with full adverbial clauses with the subordinator (*when, since, because, if*) expressed, even though here misunderstanding may also arise, especially in reference to time and cause relationship, e.g. in *As they kept on digging they grew more tired.* The two senses of this sentence would have to be traceable back to two different deep structure sources, one with Adv-Time, the other with Adv-Cause. The frequent overlapping of these

[5] The sentences are given by Schwartz as an illustration of the claim that adverbial clauses are basically adjunct to the subject of the matrix sentence.

[6] The sentence was discussed in Katz and Postal (1964: 72 - 3) in connection with their semantic theory concerning transformational rules.

two interpretations, as well as the surface identity of the sentences, could be explained in terms of general semantic theory. Two events following each other or occurring simultaneously tend to be viewed as cause and effect. Logic recognizes the existence of a common error called *post hoc ergo propter hoc.* The fact of frequent association of the two relationships has sometimes been noticed by grammarians, too[7].

In the transformational part that follows an attempt will be made to relate those absolutes which admit of temporal interpretation to full clauses of time. According to the model proposed all such absolutes are derived from the Time-dominated NP which is in turn developed as NP S (rule P5).

T1. This is a set of relative clause transformations. They add the features +WH and +Pron to the noun in the identical NP of the embedded sentence, and bring the NP to the front of that sentence; the noun segment is consequently deleted. In case the noun to be deleted has the feature +Time, the relative pronoun, which takes the place of the NP, can occur as *when* (but see the remarks following sentences 10 and 11, below). The strings resulting from these transformations can be informally exemplified by:

10. Gwendoline returned Ind the day Ind WH-pron Algernon left.
11. Gwendoline returned Ind the time Ind WH-pron Algernon left.

Ind WH-pron is on the surface realized as either *when*, or preposition and *which*. The former realization is possible only if the *Ind* involved is *pre* (previous) or *sim* (simultaneous). These conditions account for the absence of sentences like **Gwendoline returned before the time since when Algernon left* (the *Ind* in question is *in* (beginning moment) here, so it is impossible to substitute *when* for *Ind- WH-pron*); they also preclude the interpretation of *Gwendoline returned on the day when Algernon left* as, for instance, *Gwendoline returned on the day after which Algernon left* (for *when* can only introduce a clause expressing an action earlier than or simultaneous with the action of the main clause.

T2. Tense specification. It is clear that the tense of the main verb in the constituent sentence depends on the type of *Ind* preceding it as well as on the tense of the verb in the matrix. Hartung's solution[8] has been adopted here as

[7] 'A temporal relation between two events may also imply a relation of cause and effect. This is but natural, since an event subsequent to another event is often at the same time consequent upon it'. (Ohlander 1936: 91).

[8] His solution is best illustrated by the following quotation: 'Im Formationsteil wird nur eine abstrakte Tempuskategorie eingeführt, die erst nach bestimmten Transformationen unter Angabe entsprechender Kontextbedingungen zu entsprechenden Tempora entwickelt wird. Dabei nehmen wir folgende Reihenfolge an: Nach der Einführung der Klasse der Temporalkonjunktionen erfolgt die Entwicklung der abstrakten Tempuskategorie. Als Kontextbedingungen fungieren die zusätzlichen Temporalcharakteristiken der Klasse [temp] K.' (Hartung 1964: 151 - 2).

superior to one in which tense is specified for the two sentences separately and then the particular tenses of the constituent S are transformationally adapted to the contextual conditions. All details of this transformation, or a set of transformations, should be based on the general knowledge of the use of tenses in English, with special reference to the temporal clause. This problem has not been studied sufficiently, and so the formulation of the rule (rules) must be delayed. Difficulties appear particularly with regard to the use of the simple past tense to express both simultaneous and preceding actions, e.g. *We parted when this was done* and *We talked when this was done*. Obviously, this transformation must precede time-deletion transformation (next rule), for it covers all strings, no matter if they go through that transformation or not. If T2 were to follow T3, the tense specification rules would have to be formulated twice.

T3. Time-deletion (optional)[9].

$$X \text{ sim } N \begin{bmatrix} +\text{Time} \\ +\text{Pro} \end{bmatrix} K\ N \begin{bmatrix} +\text{Time} \\ +\text{WH} \\ +\text{Pro} \end{bmatrix} Y \rightarrow X\ K\ N \begin{bmatrix} +\text{Time} \\ +\text{WH} \\ +\text{Pro} \end{bmatrix} Y$$

where: K = either sim or pre.

The noun deleted must have the feature +Pro in order that the unique recoverability principle should be observed. If the noun is not deleted (i.e. if the transformation is not applied) its surface structure shape is the word *time*[10]. Nouns which have not a pro-form cannot be deleted — it would be impossible to leave out *day* or *moment*. Another condition is that the *Ind* involved must be *sim* in the matrix sentence and either *sim* or *pre* in the constituent. A change of *Gwendoline returned at the time when Algernon had an accident* into *Gwendoline returned when Algernon had an accident* is possible; that of *Gwendoline returned before the time when Algernon had an accident* into *Gwendoline returned when Algernon had an accident* is not, if the resulting sentence is to mean the same as the source. It should be remembered that the sentences given as illustration are merely informal presentations of the strings actually running through the transformation. In particular, the string K N $\begin{bmatrix} +\text{Time} \\ +\text{WH} \\ +\text{Pro} \end{bmatrix}$ need not have the form *when* in the surface structure. The relevant morphophonemic rules will be given later on.

[9] It is mentioned as 'time-place deletion' in Jacobs and Rosenbaum (1968: 212).

[10] For a discussion of pro-forms of words like *time*, see Katz and Postal (1964: 128).

T4. Gerundivization (optional). This rule generates only ungrammatical strings, which must be the input to further transformations. The rule for gerundivization can be most conveniently formulated in terms of *Aux* features[11]. The conditions on its application are different for *sim* and *pre* introduced clauses.

$$\text{T4. (a) Aux} \begin{bmatrix} -\text{Progr} \\ -\text{Mod} \\ \pm\text{Pres} \end{bmatrix} \rightarrow \text{Aux} \begin{bmatrix} -\text{Progr} \\ -\text{Mod} \\ +\text{Pres} \end{bmatrix} \text{ing } /X \text{ sim N } [+\text{WH}]\ Y - Z$$

$$\text{(b) Aux} \begin{bmatrix} +\text{P} \\ -\text{Mod} \\ +\text{Pres} \end{bmatrix} \rightarrow \text{Aux} \begin{bmatrix} +\text{P} \\ -\text{Mod} \\ +\text{Pres} \end{bmatrix} \text{ing } /X \text{ pre N } [+\text{WH}]\ Y - Z$$

where: P = either perfect or copula; $X \neq$ Ind NP

The *aux* is specified as −Modal in order that strings like the following should be excluded: **John will leave oughting to do so*. +Present and −Present are both brought under +Present, like in: *John left* having *done his work*, from *John left when he* had *done his work*. The feature −Progressive is specified to prevent the generation of **We did it John being working in the garden* from *We did when John was working in the garden*. According to the present interpretation, *We did it, John working in the garden* comes from *We did it when John worked in the garden*. P is necessary in part (b) of the rule, for in *pre* sentences the past perfect tense is frequently used; besides, in passive sentences belonging to the *pre* category the copula naturally occurs within the auxiliary, and such sentences are also handled by the rule: *We left when the work was done* corresponds to *We left, the work being done*. It will be noticed that according to rule T4 only those *pre* sentences which have the perfect tenses admit of gerundivization (although many of them may have paraphrases expressed with simple tenses, when the sentence is not reduced, e.g. *We left when he did it* for *We left when he had done it*); in the group of *sim* sentences, on the contrary, only simple tense forms can be gerundivized, and the transformation is blocked in the case of continuous (progressive) forms. The latter solution has been possible due to the fact that most simultaneous actions can be expressed in English either by means of progressive forms or in the simple tenses. The affix *ing* generated by the transformation is placed after the auxiliary and then moved to follow the first verbal element, if the auxiliary does not contain either +Have or +Copula. The transformation obviously applies only to those strings which ran through T3. It must follow T2, otherwise no simple

[11] The analysis of the auxiliary follows that in Jacobs and Rosenbaum 1968, especially in chapters 14 and 15.

formulation of the rule would be available and tense would have to be specified several times — separately for sentences with full verbal forms and for sentences with *ing* forms only.

T5. Identical subject deletion (obligatory). This transformation appears after T4, because the subject is to be deleted only if the constituent sentence contains the affix *ing* added by T4. The rule does not apply to sentences with a finite verbal form, e.g. a change of *John went when he finished the conversation* into **John went when finished the conversation* is impossible. To sentences like the one above only the rules for pronominalization apply[12]. The rule provides for subject deletion for example in *John ate when John writing a book* (from T4) → *John ate when writing a book*. The transformation operates in other fields of English syntax, as well as in the generation of adverbial clauses of various types[13].

T6. *Be ing* deletion. This rule effects a further reduction of the constituent sentence. It applies optionally to those strings which ran through T4 and to those strings only.

$$\text{T6. } X\ K\ \underset{[+WH]}{N}\ \ Y\ \text{be ing}\ Z \rightarrow X\ K\ \underset{[+WH]}{N}\ \ Y\ Z$$

where: K = either sim or pre, Y = either NP or null (the latter occurs if the sentence ran through T5 in addition to T4)

K is *sim* in most cases. The rule applies to sentences containing *pre* mainly if they also contain a verb in the passive, e.g. *We went on when the job being done* (after T4) → *We went on when the job done*. The other group of sentences to which rule T6 applies are those which do not include a verb in the passive but which contain forms like *being gone* (verbs that have preserved the present perfect tense forms with *be* plus past participle)[14]. According to this solution, then, sentences like *Mary gone, we could do our work* must be indirectly derived from *When Mary was gone...* rather than from *When Mary had gone...* This does not account for *Arrived there, I saw a change*, since there is no string **When I was arrived there...* Still, the number of verbs like *arrive* is very limited and the difficulty might be overcome by postulating an obligatory rule converting the perfect forms with *have* of such verbs into forms with *be* at a certain stage of the generation of adverbials. In any case, this is clearly a marginal problem and it need not invalidate the overall solution. A more serious difficulty is created by the necessity of accounting for the absence of sentences like **John president, we left the country*, or **Mary young, we looked after her*. On the other hand, sentences like *As president he left the country* and *He left the country when young* are grammatical, as are *The meal over, we had a nice game of bridge.*, or *John there, Mary could sit quietly and work*. The difficulty arises in constituent sentences with a subject different from that in the matrix, and only when the element following *be ing* is either an NP or some kind of adjective. It would be possible to account for this lack of regularity in an *ad hoc* way, for example by excluding NP's from the range of Z (in rule T6) in the case when *Y* is an NP (that is, if the subject, which is not the same as the matrix subject, has not been deleted before) and *K* is *sim*. Still, it is not unreasonable to expect that some more general way of stating the restrictions may be found.

T7. K N deletion. It does not apply to strings that did $\begin{bmatrix}+WH\\+Pro\end{bmatrix}$ not undergo T4 (gerundivization). Otherwise it is obligatory or optional, depending on the form of the input string.

$$\text{T7. } X\ K\ \underset{\begin{bmatrix}+WH\\+Pro\end{bmatrix}}{N}\ \ Y \rightarrow X\ Y$$

where *K* stands for either *pre* or *sim*.

Contexts must be stated in a detailed manner. The rule is obligatory if K = pre. That is, in all sentences such as *While being there I felt rather not very well* the only interpretation is that the two actions were simultaneous (for otherwise the elements underlying *while* would have been deleted by T7). By the same provision all strings of the form **When having gone there* must be converted into *Having gone there*. T7 is also obligatory for all those *sim* sentences which went through T4 but not through T5, that is sentences with a subject different from that in the matrix. Thus, **We did it when John being here* → *We did it John being here*, or, to quote an example of a sentence which went through T6 as well, **We discussed the matter while Mary outside* → *We discussed the matter, Mary outside*. In other instances the rule applies optionally: *I was sleepy when writing this letter*, or (if T7 applies) *I was sleepy writing this letter*, *I was unhappy while at school* or *I was unhappy at school*. But **President, John was cruel* is impossible, whereas *As President, John was cruel* is not. This limitation confirms the supposition that noun phrases must receive a special treatment in the whole set of rules generating adverbials of this kind.

The sentence *I was unhappy at school* suggests that there may be a way of eliminating the category of place adverbials from the group of adverbials outside the VP[15]. However, a definite conclusion cannot be drawn at the mo-

[12] See Lees (1963: 99 - 103).

[13] A rule for subject deletion was formulated, as the erasure principle, in Rosenbaum (1967: 6) and discussed in the same work (17 - 21).

[14] For a discussion of the history and the present-day status of such verbs consult Closs (1965).

[15] The suggestion was made by Chomsky (1965: 218 - 9): 'It is also worth noting that many of the Manner Adverbials, like many other Adverbials, are sentence trans-

ment, as long as a regular way of dealing with the ambiguity of sentences like the one below is not found: *The TV showed us the queen at home*. The proposal that instead of T5 (identical subject deletion) there ought to be a rule for the deletion of an identical NP, which would be on a par with Lees' rule of pronominalization, does help to explain the above example, but such a rule would not account for the lack of ambiguity in *I heard from him in England*, where *in England* can only refer to *I*[16].

T8. A set of morphophonemic rules performing the substitution of morphemes from the lexicon for every occurrence of K N. The three morphemes that occur here are *when*, *while*, and *as*. This analysis differs from the ones to be found either in Katz and Postal (1964) or in Jacobs and Rosenbaum (1968), where *when* is regarded as the only form of relative pronoun with the feature +Time. In Jacobs and Rosenbaum *when* is mentioned as the only possibility in the time-deletion transformation. Those views are correct, but only as far the *pre* relation goes: *He stood up when he finished the soup*, but not **He stood up while he finished the soup* with a non-simultaneous interpretation. In *sim*, however, *while* and *when* freely occur, and occasionally *as* also functions as a temporal clause connector. There is no reason to assume that the forms *while*, *when*, and *as* appearing in the various reduced clauses are different from the identical forms in complete clauses. That is why it is better not to introduce the morphemes in the early stages of the generation of adverbials. The connectors will now be introduced in full clauses by the same transformation as will introduce them in the reduced adverbials.

$$\begin{bmatrix}+\text{WH}\\+\text{Pro}\\+\text{Time}\end{bmatrix}$$

The answer to the question why it is just the words *as* and *while* that occur beside *when* in temporal clauses is not very difficult. *As*, besides its other functions, served as a temporal clause connector already in the Middle English period[17]; moreover, from the synchronic point of view, its function can partly be explained by the fact that it is a relative pronoun in other kinds of sentences (*such people as never come here, the same sentence as the one I've mentioned*); besides, it regularly serves as the causal clause connector (on the proximity of the temporal and the causal clauses see note 7 and the discussion on pp. 96 and 97). *While* probably came to be used in its subordinating function

forms with deleted subjects. [...] Similarly, Place Adverbials (at least those which are VP complements) must sometimes, or perhaps always, be regarded as Sentence transforms (so that, for example, "I read the book in England" derives from an underlying structure very much like the one that underlies "I read the book while (I was) in England").

[16] The ambiguity of sentences containing adverbial clauses with deleted subject was noticed by Harris (1965: 393).

[17] NED:479.

because of the presence of the element +time in its lexical matrix, and owing to its morphological form (*while* is another WH- word).

The following rather incomplete set of T8 rules may be put forward:

A/ pre N $\rightarrow$ when /X—Y

$$\begin{bmatrix}+\text{Pro}\\+\text{Time}\\+\text{WH}\end{bmatrix}$$

where X and Y stand for any strings.

This rule generates the form *when* in all instances where the temporal clause expresses an action previous to the main clause and where the connector has not been deleted by any of the preceding rules. Sentences like *He went there when he finished his work* are the result of this rule.

B/ sim N $\rightarrow$ $\begin{cases}\text{as} & /\text{X—NP\#} \\ \text{while, when} & /\text{X—Y} \\ \text{while, when, as} & \end{cases}$ (a) (b) (c)

$$\begin{bmatrix}+\text{Pro}\\+\text{Time}\\+\text{WH}\end{bmatrix}$$

where: X=any string; Y≠NP, whether followed by lexical formatives or by #.

Line (a) produces sentences like *John was extremely lenient as president*. Line (b) gives *He slept* $\begin{matrix}\textit{while}\\\textit{when}\end{matrix}$ *making plum pudding* or *You mustn't talk to him* $\begin{matrix}\textit{while}\\\textit{when}\end{matrix}$ *there*. Line (c) covers all unabridged forms of the temporal clause. This set of rules is incomplete mainly on account of the special behaviour of *as*. It seems that there are some restrictions on its use which cannot yet be stated. Some of them are again due to the frequent overlapping of the time and cause interpretations.

Let the following four sentences, which have all undergone T3, serve as informal illustration of the operation of rules T4 - T8:

a. *John felt happy sim WH John devoured the tuna.*
b. *We walked in pre WH John had devoured the tuna.*
c. *Aristides left the country sim WH Themistocles was in Athens.*
d. *Timothy liked swimming sim WH Timothy was president.*

T4. a. *John felt happy sim WH John devouring the tuna.* (T4, a, applies optionally)
b. *We walked in pre WH John having devoured the tuna.* (T4, b, applies optionally)
c. *Aristides left the country sim WH Themistocles being in Athens.*
d. *Timothy liked swimming sim WH Timothy being president.* (in the last two examples T4, a, applied optionally)

T5. a. *John felt happy sim WH devouring the tuna.* (T5 applies obligatorily if the input is the result of T4)

b, c. T5 does not apply, since the subjects are not identical

d. *Timothy liked swimming sim WH being president.* (conditions — the same as in a.)

T6. a, b. the rule does not apply, for the strings do not contain the element *be ing*.

c. *Aristides left the country sim WH Themistocles in Athens* (optional)

d. *Timothy liked swimming sim WH president* (optional)

T7. a. *John felt happy devouring the tuna* (optional)

b. *We walked in John having devoured the tuna* (obligatory)

c. *Aristides left the country Themistocles in Athens* (if T6 was previously applied), or:
Aristides left the country Themistocles being in Athens (if T6 was not applied). T7 is obligatory in either case.

d. T7 does not apply, because *sim WH* is followed by *NP #*.

T8. a. *John felt happy while John devoured the tuna* (no T4, T8 B,c applies; the second occurrence of *John* must be substituted by a pronoun, but this is outside the scope of the present article), or:
John felt happy while devouring the tuna. (T4, no T7, T8 B,b applies)

b. *We walked in when John had devoured the tuna* (no T4, T8 A applies)

c. *Aristides left the country when Themistocles was in Athens* (no T4, T8 B,c applies). If T4 is applied to either example b. or example c., T7 obligatorily applies and T8 cannot apply.

d. *Timothy liked swimming when he was president* (no T4, T8 B,c applies), or:
Timothy liked swimming as president (after T4, T6, T8 B,a applies).

The next set of rules consists of the required permutations. They ought to appear only as late because the positioning of the temporal clause often depends on its form. Full clauses freely permute with the main clause, but this changes as they are reduced. It is more economical to state the placing of adverbials in terms of permutations than to introduce the node *Adv* in several places in the formation part; apart from the reasons given in the discussion of the phrase structure, above, an alternative solution would be unfavourable because it would create a need for an additional semantic rule to analyse two sentences differing only in the placing of an adverbial as semantically identical. Unfortunately, too little is known as yet of the adverbial positions in English, and the formulation of the permutations must be delayed.

The last to be considered is the question of prepositions existing in the surface structure as part of time adverbials. As has already been said, the preposition depends on the type of the time relationship involved, and on the NP. The latter factor is particularly important where the sim relationship is concerned, and also in case of the pre relation if the next element is the pro-form of the word *time*. In the latter case the preposition is always *at*,

just as with the sim relation in the same context. The overall solution proposed here is that the shape of the prepositions should be signalled in the lexical matrix of the nouns specified as +Time. The preposition *at* would be given in the matrix of the noun *time* when it has the features +Pro and either +Sim or +Pre (one of the latter being introduced in the matrix from the preceding *Ind*). The noun *yesterday* would be specified as —Prep when the time relationship is *sim*. Similar features could be assigned for every other noun possessing the element +Time.

The remaining transformations required for giving the sentences their full shape do not interest us here, since they have been formulated elsewhere and do not affect the special rules generating temporal subclauses.

The present paper has dealt only with one line of generation, leaving almost untouched those adverbial clauses which arise through the development of the Adv-dominated NP as (Art) N (S).

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