## **OPERATOR-GRAMMAR OF ENGLISH**

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This paper sketches how the grammar of English is obtained in terms of a single method of combining words into sentences. The method both produces the sentences and yields their meaning out of the meaning of the words.

## I. THE GRAMMATICAL THEORY

1. Entry into Sentence

The basic grammatical relation is the partial order among the words X, Y, etc., of a sentence in respect to their entry into it:  $X \ge Y$  means that X is a later or simultaneous entry with respect to Y; and if  $X \ge (Y,Z)$  and there is no word-occurrence W such that  $X \ge W \ge (Y,Z)$ , then X is the operator (next later entry) on Y, Z as arguments (immediate prior entries). In

## I know John came

know is the operator on I, came; and came is the operator on John. It will later be seen that an entering word may be reduced to an affix or to zero, so that the partially ordered relation among the words (including the affixes and the reconstructed zeroed words) present in the sentence may have to be calculated by correcting for the reductions. Speaking therefore of the syntactically primitive, generally affixless, words whose presence in a sentence can be reconstructed from the presence of affix-bearing words, their partial ordering of entry is determined by the fact that each word A can enter a sentence only given the immediately prior entry therein of ordered words belonging to certain classes B, C. The B, C are the entry (or argument) requirement for A, and their being immediately prior means that they are free for it, i.e. have not already served to satisfy the entry requirement of some other word entering the sentence. The operator A enters into a fixed position in respect to its ordered arguments: in English, after the first of them.

In order to have a sentence, there must be words whose entry requirement is null: these are primitive arguments, N, and include the concrete nouns and non-specific nouns or pronouns (such as *that, something, one*). All other words are operators, O, and it turns out that their entry requirements can be characterized merely in terms of N and O. Thus some words are  $O_n$ , requiring a single N: walk, young, in John walks, John is young (see II.2 for the *is*). Others are  $O_{nn}$ : eat, near, in John eats meat, John is near the house. Operators whose arguments are only N may be called elementary, as against the non-elementary operators, at least one of whose arguments is O. Such are  $O_O$ : continue, probable, in John's walking continued, That John walked is probable;  $O_{nO}$ : know above;  $O_{On}$ : surprise, in That John walked surprised me;  $O_{OO}$ : cause, in The coming of rain caused the crops to revive. There are no entering words whose entry requirement is something other than N,O, or is some particular type of O such as only elementary or only non-elementary.

The argument-requirement thus classifies words and creates the three sets: primitive argument, elementary operator, and non-elementary operator (with their subsets). It is true that many words are founds in positions which do not conform to their argument requirement. However, in all these cases it is possible to explain the deviation, usually as due to zeroing. For example, in *His purchase is too heavy* we have *heavy*  $(O_n)$  with *purchase* (O) as its apparent argument. It will be seen below that it is possible to take the underlying sentence as *That which is his purchase is too heavy* (with zeroing of *that which is*), where the subject of *heavy* is the primitive argument *that*. All the zeroings have to be justified independently of any theory, and it is only after recognizing their existence that we arrive at argument-requirement as a condition for the presence of words in a sentence.

In English, the operator-argument relation is indicated not only by position but also by affixes. When a word enters as operator it receives the -s suffix which is called the present tense but can be considered to be primarily an operator-marker. In some languages, primitive arguments receive case-endings to indicate their argument relation to their operator. English does not have this, but some arguments (not in first position) receive prepositions to show their relation to their operator, as in *He relies on me*. However, when an operator X becomes an argument, i.e. when a further entry comes in as operator on X, then X receives an argument-indicator. The new argument status of Xis then indicated: either by *that*, whether before the argument-sentence whose free operator X is (*He knows that John works; He wonders whether John*  works); or by replacing the -s (operator-indicator) on X with for ... to... to. ... on the argument-sentence (He prefers for John to work), or with -ing on X accompanied by 's and prepositions (of, by, etc.) on the arguments of X. The latter argument-indicators make the argument-sentence look somewhat like a noun-phrase (i.e. like a primitive argument plus modifiers, explained below). The operator receiving an argument-indicator remains an O, and can keep its arguments. The fact that it has become an argument does not make it an N and it cannot be operated on by elementary operators. Thus in John's walking continueed, continued is  $O_O$  with argument walk; walk is  $O_n$  with argument-indicator -ing, and John as argument of walking receives 's.

Among the operators which are recognized on the basis of their argument requirement is a special set of metalinguistic operators. Some of these are  $O_{nno}$  operators such as say, ask, command; another is same which can be used metalinguistically to assert that words in two entry positions in the sentence are the same word or refer to the same thing. These operators can be zeroed in certain situations, for reasons discussed further on; and recognizing where they have been zeroed makes it possible to formulate a simpler and more regular grammar of the language than would otherwise be possible.<sup>1</sup>

## 2. Likelihoods

A condition on word entry, which is peculiar and crucial to language, is that each operator word has different estimated likelihoods of occurring with different words in its argument domain. We speak here of likelihood as estimated by speakers of the language, because actual frequency counts, to be representative, would require too great a corpus. Thus *fall* has what one might call normal likelihood of occurring with *rock*, *book*, or *stick* as argument, but little likelihood of occurring with *rock*, *book*, or *stick* as argument, but little likelihood of occurring with *air* as argument, and vanishingly small likelihood of occurring with *vacuum* as argument. The normal likelihood is called the selection for the given operator. Conversely, a word has a normal likelihood of occurring under other operators. The normal likelihood of an entering word X in respect to its prior entering words, in all sentences in which X appears, is its downward selection, and that in respect to its next entering words is its upward selection. There are certain extreme situations of likelihood, and it is these that are important.

One extreme case is that of exceptionally high likelihood. E.g. the second argument of the  $O_{nO}$  expect is an operator, as in *I* expect John to leave or to speak or to be here, etc. Of these, certain ones, synonymous under expect, have a favored high-likelihood status. These are arrive, be here, come, etc., and it will be seen below that they are the ones that are zeroable. Another example is that for the ordered argument-pair man, milk (and so perhaps also

in the pair *maid*, *milk* and *cow*,*milk*) the operator upon them with favored likelihood is provide, deal in, or the like (yielding *milkman*, *milkmaid*, *milchcow*), while for the pair *punch*, *milk* the favored operator would be *contains* or the like. Alternatively, one might say that a more general operator such as *is characterized by*, *has particularly to do with* is the favored one in all these cases, so that  $\uparrow$ *The man who has particularly to do with milk is late*  $\rightarrow$  *The Milkman is late*, while *The man who spilled the milk is late* is not reduced. The form with  $\uparrow$  is not proposed as a sentence of the language, but as a reconstruction which stays within the bounds of the entry relations among English words.

Another extreme case is that of words which have broad selection, i.e. normal likelihood of entry upon an exceptionally large number of words in the domain of their argument. Thus be in a state of, be in process of (be on), have the property of, etc., can have almost all operators, or all those of a given time-stability, as second arguments. These provide adequate reconstructions, and in some cases actual historical sources, for affixes; He is still in his childhood reduced from  $\uparrow$ He is still is the state of his being a child.

A third extreme case is that of words with virtually no preferences as to operators on them. These are non-specific nouns (some are called non-referential pronouns) such as indefinite *something*, definite *that*. Such N can occur with normal likelihood as arguments of virtually all operators. They are words without a preferential selection, and are zeroable in many situations.

Yet another extreme case is that of entering words which have exceptionally low likelihood in respect to their prior entering words. For example, the semicolon (in writing-in speech it is the lowered intonation of a secondary sentence) is most unlikely to occur as operator between a sentence  $S_1$  and a sentence stating that  $S_1$  is false or improbable or the like. We may say He went; that he went is true or He went; that he went is probable but are most unlikely to say He went, that he went is false or He went; that he went is improbable. It will be seen later that this explains why we can say He truly went, He probably went, but not \*He falsely went, \*He improbably went.

These estimated likelihoods of a word in respect to words in its argument or operator domain can of course not be measured, and the estimates vary in detail as among speakers. At best one can speak of a few grades such as: exceptionally likely, normally likely, less than normally likely, equally likely for all choices of words in its argument or operator domain, exceptionally unlikely. However the likelihood-ordering on words in the argument (or operator) of an entering word is rather stable, especially in the gross grades listed here. What is more important, extreme likelihood conditions, such as those noted above, permit the entering word in question to be reduced in physical shape.

## 3. Reduction

Reductions are the major peculiarity of language, the event that in many sentences conceals the straightforward entry relation described above. They may occur in an entering word when it has one of the stated extreme cases of likelihood in respect to prior or next entering words.

Thus in the case of favored high likelihood, the entering word is in many cases reduced to zero: Given the sentence John is here, if expect operates on the pair I, here (the latter having operated on John), we obtain the sentence I expect John to be here, but also I expect John. In the latter we can say that to be here has been zeroed as the favored second argument of expect. There are strong grammatical reasons for saying that in I expect John we have not merely a noun object of expect by the side of the sentence-object of expect which is seen in I expect John to be here. One is that the meaning ('to be here, to come') holds here for all choices of nouns as object of expect. Another is that the same nouns which do not normally occur as subject of be here do not normally occur as noun-object of expect: \*Time is here, hence \*I expect time to be here; and \*I expect time. Hence though I expect John looks like a simple sentence, it is I expect John to be here with to be here reduced to zero.<sup>2</sup>

Another example of zeroing of a high-likelihood entry is in compound nouns, as in milkman from man who delivers milk or man who has particularly to do with milk. Almost all productive compound nouns  $N_2$ - $N_1$  can be replaced by  $N_1$  especially of  $N_2$ , or the relative-clause forms  $N_1$  which has particularly to do with  $N_2$ , or  $N_1$  which  $VN_2$  where V' is a favored high-likelihood (or "appropriate") verb for  $N_1$  subject and  $N_2$  object. The relative-clause forms may be stylistically heavier than the compound-noun, but they are paraphrastic to it and are normal in the same sentential environments in which the compound-noun is normal. A somewhat different favored zeroing is of which is, who is in many situations: The book which is here is for you  $\rightarrow$  The book here is for you; the man who is coming next  $\rightarrow$  the man coming next. In this position, which is, who is are far more likely than anything else.

Certain words having a very broad selection, i.e. having normal likelihood in respect to exceptionally many arguments, can be reduced to being affixes on their arguments. The process is historically known in English and in other languages. *Childhood* is historically reduced from a compound noun containing the free Old English noun *had* "condition": *the state of being a child*. For most English affixes we cannot find free-word historical sources. However, while there are many affixes, and many of them occur on only a particular set of words, the meanings of most affixes are suspiciously similar and few: state, property, tendency, process, and the like. They thus have the syntactic, though not to our knowledge the historical, status of being variants, reductions, of a few operators such as *be in the state of, have the property of* which by virtue of their general meaning have exceptionally broad selection, i.e. can occur normally on exceptionally many (second) arguments, and would therefore be reducible.

In the third case, the words which can occur with normal likelihood under any operator equally are reducible to zero. These are something, a thing, that, people (as indefinite), etc., whose meanings are so unspecific as to allow them to be arguments of virtually any operator. Thus I read, He is eating, do not have to be analyzed as intransitive verbs existing by the side of their transitive forms, but as zeroing from I read things, He is eating things. This is supported by the fact that I read means I read various unspecified things such as can be read, and not for example (without special environing justification) I read palms. For this reason, this object-zeroing is not used, except in special environments, for verbs where it is rare to have a non-specifying object such as things: e.g. (\*) I find, (\*) I wear. Like all others, this zeroing occurs only in particular entry situations, i.e. in what would be called particular syntactic environments. Thus the non-specific noun is zeroed in object position, but not, in English, in the subject position of the free ("main") operator: Someone came, or People came is not reduced in English to \*\* Came although we have We saw skiing from We saw people's skiing, and Skiing is popular from People's skiing is popular. The free operator's indefinite subject is however zeroable together with which is if what follows is another noun. In His description of the affair has been torn up, we have

> Something has been torn up; the same something is his description of the affair

 $\rightarrow$ Something which is his description of the affair has been torn up  $\rightarrow$ His description of the affair has been torn up

The view is thus that not only in meaning but in the actual underlying words of the sentence the subject of *is torn up* is not the nominalized sentence *his description of the affair* but the *something* which is the object in that sentence. The zeroing of *something* accords with many other zeroings of non-specific nouns in comparable situations. It is such zeroings that enables us to say that  $O_n$  such as *heavy* do not occur as operators on O such as *purchase*, something which permits the basic distinction between primitive arguments, elementary operators, and non-elementary operators.

In contrast with the reductions in these high-likelihood and broad-selection situations, there are cases of very low likelihood (what one might call rejection in contrast to selection) which block reductions that would otherwise take place. Thus the sentence pairing in *He went; that he went is false*, though non-sensical, can be said, but is most unlikely. But the reduction from this to *He falsely went* is blocked by its unlikeliness, whereas *He went; that he went is certain* is reduced as will be seen below to *He certainly went*.

A particularly important kind of broad-selection reduction is that affecting metalinguistic operators. I say or I say to you can of course occur on every sentence. I ask you, I request (or: command) you can occur normally on very many. There are also other operators with a somewhat less definite metalinguistic status (know, think, wonder, insist). In all of these the indicator on the argument-sentence can be reduced to an intonation:

She said to him that John left  $\rightarrow$  She said to him: John left I know that John left  $\rightarrow$  I know: John left She asked him whether John will leave  $\rightarrow$  She asked him: Will John leave? I wonder whether John will leave  $\rightarrow$  I wonder: Will John leave? She requested of him that he leave  $\rightarrow$  She requested of him: Please leave! I insist that you leave  $\rightarrow$  I insist: Leave!

When the separated metalinguistic part, before the colon, is *I say*, *I ask*, *I request* (and not *He says*, or *I said*, etc.) it has a performative status and is zeroable:

I ask: Will John leave?  $\rightarrow$  Will John leave?

Reductions also occur in a situation related to that of high likelihood, namely in certain positions when a word-occurrence is the "same" word, or alludes to the same thing (even if a particular unicorn), as another word-occurrence in the same sentence, i.e. somewhere under the same occurrence of an operator-word. This is repetitional ("referential") reduction. Under and, or  $(O_{00})$ , words in the second sentence are zeroed if they are the same as words of the same entry status in the first: He played violin and she piano. Under all  $O_{00}$ , the operator in the second sentence, with its following arguments but not its tense, is zeroed if it is the same as the parallel portion in the first sentence: I won't go there if you will. Under the semicolon intonation, treated as  $O_{OO}$  operator, an argument in the second sentence is replaced by which, who if it refers to the same as does an argument in the first sentence; the semicolon is reduced to comma and the which, who usually move to the beginning of the second sentence, and the whole second sentence is moved to after the antecedent: John will be late; I had phoned John  $\rightarrow$  John–I had phoned him–will be late  $\rightarrow$  John, whom I had phoned, will be late. Arguments, in any position in a sentence, which refer to the same as an argument in a preceding sentence, or (with certain limitations) in a preceding or following argument-sentence of the same sentence, can be reduced to he, she, it, etc.: John left and I missed him, Our distrust

of him prevented our voting for John.

Certain repetitional zeroings are subject to particular likelihood conditions. Thus in operators  $O_{nO}$  (e.g. I prefer that John should take the book) and  $O_{nnO}$  (e.g. I asked Mary if John took the book), there is a possibility of the "lower" first or second argument of the argument-sentence (i.e. John, book under take) having the same referent as the "higher" first or second noun arguments of the free operator (I, Mary, under prefer, ask). We find that for each such free operator one or the other of the lower arguments, and only in that case is the lower argument zeroed.

1. Under want, prefer, like the lower subject is zeroed if it is the same as the higher subject: I prefer for me to take the book  $\rightarrow$  I prefer to take the book (but no zeroing in I prefer for him to contact me); also I promise John that I will go  $\rightarrow$  I promise John to go (but no zeroing in I promise John that he will win).

2. Under merit, suffer the lower object is zeroed if it is the same as the higher subject: We suffered their deridings of  $us \rightarrow We$  suffered their deridings (but no zeroings in \*We suffered our attacks on them).

3. Under catch, order, the lower subject is zeroed if it is the same as the higher object: I caught John in his taking the book  $\rightarrow$  I caught John taking the book; I ordered John for him to come immediately  $\rightarrow$  I ordered John to come immediately.

4. Under defend, the lower object is zeroed if it is the same as the higher object: I defend John from their attacks on him  $\rightarrow$  I defend John from their attacks; in French the two uses of défendre in défense de la partie and défense de fumer are due to défendre being not only in type 4, as in English, but also in type 3, like prohibit.

5. There are also free operators which admit of no referential zeroing: John observed his own slurring of the vowel, John observed our calling him (but zeroing of an indefinite lower subject can occur: John observed people's skiing  $\rightarrow$  John observed the skiing). It is clear here that under each of these  $O_{no}$ ,  $O_{nno}$  operators, the position-pair of zeroing and antecedent is the position-pair which has, under that operator, the greatest likelihood of having the same word.

We can now summarize the reductions. They apply to entering words which have either exceptionally high likelihood in respect to the particular word entering before or after them, or else normal likelihood in respect to exceptionally many words in the set that can enter before or after them (according to their entry-requirements); and they apply to words which are the same, or refer to the same, as some other word in the sentence, in positions where this sameness is likely. Some reductions are to zero, and some are to short words or affixes. Almost all reductions are optional, though a few are required;

and reductions are avoided in certain positions: e.g. zeroing does not generally occur in the first argument of the free operator (subject of the sentence: People are often wrong  $\neq **Are$  often wrong). In addition, there are a few other changes of shape. Thus a secondary (post-semicolon) sentence may be moved into the inside of the first sentence; especially, if there is a word occurring in both sentences, to after the given word in the first sentence; and this almost always if the second occurrence of that word has been reduced to which, who. This may be considered a reduction of distance between the two occurrences of the word. Also, among the arguments and modifiers (residues of relative clauses) which come after an operator, if the second is shorter than the first it frequently moves to before the first: Give it to the girl, \*\*Give (to) the girl it, Give that big book over there to the girl, Give (to) the girl that big book over there. Virtually all the "permutations" in English grammar arise either from leftward movements of a secondary sentence (under semicolon), or from the leftward movement of the shorter post-operator segments (length-permutation).3

Some reductions occur on all words in the argument-domain, e.g. the zeroing of *thing which is*. Other reductions occur only on a subset, or even just a single synonym-set, of words in the domain, e.g. *arrive*, *be here* under *expect*, or the rejection of *falsely*, *improbably* as adverbs of fact. The latter reductions are the events that introduce restrictions into grammar, creating the welter of rules in contrast to the rather unrestricted but likelihood-graded entry of operators upon their arguments.

The reduction of an entry takes place as soon as the stated conditions for it are satisfied, or not at all. If the conditions for it are satisfied and the optional reduction has not taken place nothing can make it take place later after further entries or reductions have occurred in the sentence. This is a most fortunate circumstance, making possible a finitary definition of the application of reduction, and a computation, even by a syntactic computer program, of the structure of a sentence. In the great bulk of cases an argument is reduced as soon as there comes the operator on it which permits its reduction: John is here; then I expect John to be here  $\rightarrow$  I expect John. In some cases two reductions become possible at the same time; these must be presumed to occur unordered as among themselves. Thus in (1) My friend has arrived; I had told you about him we can have the shifting of the secondary sentence:

## (1) $\rightarrow My$ friend–I had told you about him–has arrived

and we can have wh-pronouning

(1)  $\rightarrow My$  friend has arrived, whom I had told you about

The effect of both taken together is

## My friend, whom I had told you about, has arrived

In quite a few cases certain reductions become possible only after other reductions in the same material. Thus I ask is zeroed only after whether on its second argument has been reduced to question-intonation, the latter being a reduction under a much larger set of operators than ask above. Also, which is is zeroed only after prior grammatical events: First the repeated argument in the secondary sentence is reduced to which, and the whole secondary sentence moved to after the antecedent argument. Then in case which is followed by is, the sequence which is may be zeroed. (It is not a direct zeroing of the repeated noun.)

> My friend has arrived; he is from Alaska  $\rightarrow$ My friend has arrived, who is from Alaska  $\rightarrow$ My friend, who is from Alaska, has arrived  $\rightarrow$ My friend, from Alaska, has arrived

In rare cases there seems to be a delayed reduction, but this is when the reduction becomes possible only due to a later operator. Thus the subject *you* of the operator *come* is zeroable, but only in the question:

You are coming I ask you whether you are coming (or not) →I ask you: Are you coming? →Are you coming? →Coming?

The high likelihood lies not in *you* as argument of *come*, but in *you* as argument of *are coming*?, under *ask* operating on *come*; hence the zeroing of *you* does not occur in *you are coming*, but only after this has been operated on by *I ask you*.

# II. SKETCH OF ENGLISH GRAMMAR

The ordered entries and reductions described above suffice to produce the sentences of English, in a way that indicates their meanings and grammatical ambiguities. A grammar of this kind requires only a list of words for every argument-requirement set (e.g., N,  $O_n$ ,  $O_{nn}$ ,  $O_o$ ,  $O_{no}$ ), and a list of the specific reductions (along the types indicated above) with the subdomain of words on which the reduction acts and with the conditions which must be satisfied in order for it to act. Any ordering of the reductions follows from the order in which their conditions come to be satisfied. Such a grammar arranges the grammatical structures in ways that are not customary. Therefore it may be useful to have a sketchy overview of English grammar in a more traditional organization, in order to see how the main structures are reached by the entries and reductions.<sup>4</sup>

## 1. Word-formation

The great bulk of affixes can be analyzed as being produced by the syntax acting on mostly affixless words.

A few affixes are neither operators nor arguments. In English, it is convenient to consider the present tense -s as being an indicator of operator status, with only loosely present-tense meaning; later, other tense morphemes can replace it. In addition, somewhat as some languages place case-endings on noun-occurrences to indicate their status as first or second, etc., arguments of particular sets of operators, so English and many other languages place an argumentindicator (English *-ing*, as also *that*, *whether*, *to*) on an operator which has become an argument, and further indicators (*'s*, *of*, *by*) on its arguments in turn.

The remaining affixes can be considered to be operators or arguments in the sentences in which they occur. There is some question about the analysis of the English plural and tense affixes, and a few others, chiefly the feminine and diminutive (e.g. *lioness*, *booklet*). Here the affix can be obtained as a modifier of its host (the word to which it is attached): He walked  $\leftarrow$  'he walks; his walking is before [some other operator]; *lioness*  $\leftarrow$  a lion which is female. However, it is also possible to obtain most of these affixes in the same way as the other affixes of English, as follows:

In English, virtually all suffixes, and final words of a compound, have the status that the preceding word to which they are attached is their modifier or second-argument, where 'X is a modifier of Y' means that X is the residue-after zeroing which is-of a relative clause attached to Y. And prefixes are generally operators, unstressed and phonemically changed, but requiring no permutation, with the words to which they are attached being their second arguments. The affixes are thus the syntactically important element, which has been reduced to affix form not because of their syntactic unimportance but because of their broad selection: as noted, the meanings of affixes, and thus of the operators whose reductions they would be, are have property, have tendency, be in a state, be a result, be an agent, negation, cause, etc. -words which have very broad selection in respect to their second argument. It is of interest that almost all suffixes can be obtained via compound nouns, where the position of the final element is due to the compound form, so that

the reduction to suffix is simply in stress (and suppletion, to be considered immediately):

He is in his second childhood ← <sup>•</sup>He is in his second child-state ← <sup>•</sup>He is in the second state of his being a child

A's correlation with B is considerable  $\leftarrow$ "A's correlating-degree with B is considerable  $\leftarrow$ The degree of A's correlating with B is considerable

It should be noted that the modifiers (e.g. *second*) and operators (e.g. *considerable*) on the affixed word are often selected by the affix, which is syntactically the head of the affixed word.

As an example of a suffix with known history, we have adverbial -ly (only partly different from the -ly of manly). Historically, we have here an indirect case of the noun for body, form, with an adjective modifier A, equivalent in free words (with prepositions for lost case-endings) to PAN. As the noun with its case-ending was reduced in situ to a suffix, the Aly retained the syntactic status of PAN: in A manner (or: form). As elsewhere, the word is the modifier of its affix.

In -hood and -ly we see a situation which is significant though not common: Our inability to find the free-standing word which had been reduced to the suffix is due to the loss of that word (outside of affix position) in competition with some other word (e.g. state, way in the two cases), so that instead of saying that -hood is the reduction of the modern form of had we have to say that it is a suppletive reduction of state or the like in compound-noun position. Such suppletive relations can be found also for affixes which present no evidence of a historical source in a free-standing word. The importance of stating the possibility of such a relation is in showing that the relation of affixes to their host is not something over and above relations existing between separate words, namely not something different from operator-argument relations (in terms of which "modifier" will be defined below). Morphology, for all its being a separate machinery in language, does not do anything in its occurrence in English sentences that cannot be done by syntax. This is not to say that all morphology is a deposit of syntactic events. Some of it is, as in the case of -hood. Some of it goes back to the syntactic morphology of operator and argument indicators, as in the case of the case-ending which is an essential part of the source of adverbial -ly. Much of it, in one language or another, may well have existed independently of syntax: but syntax has accomodated it, using the affixed words in ways equivalent to simple-word constructions.

## 2. Word Classes

Since the entry theory admits word-class distinctions  $(N, O_n, O_o, \text{etc.})$  only in respect to the entry-requirements as seen above, we consider-very sketchily-how the various morphological and syntactic classes are obtained from these.

First, the specialization of operators into verbs, adjectives, prepositions, and nouns (such as *father of*). The verbs are separated off from the others by the fact that the loosely present-tense operator-indicator is attached directly to the operator, whereas for the others it is in some languages said separately (phonemically carried by be) and in other languages omitted entirely. The other tenses, which replace the argument-indicator (even in those cases where the present tense is omitted), arise from before, after, and possibly other timeorder connectives to other operators in the sentence, and ultimately to the zeroed I say or other metalinguistic operator which can be reconstructed as the latest entry on the sentence.<sup>5</sup> The operators which are generally more likely to occur under time-order operators relating them to other verbs in the sentence are the ones which get the tense directly, and so become verbs: walk, hope, as against *large*, *father*. The decision as to which operators are so treated is fixed by historical convention, and does not vary with current estimates of likelihood. Of the non-verb-operators, the prepositions are a small set of short words with very broad selection: up, near, to, etc. In some languages they are distinguished from adjectives in that the affixes arising from their noun arguments (plural, gender, etc.) do not spread to them. The noun operators, such as father of, are the most stable in respect to their arguments, i.e. the least likely to be under time-order operators, and are therefore subject to the same affixes as primitive-argument nouns, in receiving plural suffix, in selecting gender or sex affixes (whereas adjectives, if they receive such, do so only by spread-"agreement"-from their argument noun), and in being appositions to the (below). The remaining operators are the adjectives.

The referential pronouns are replacements of second occurrences of an argument; and the other pronouns are simply nouns (or arguments) of non-specific allusion.

The adverbs and subordinate conjunctions, which are the modifiers of operators and of sentences, are obtained, like all modifiers, from wh relative clauses. There are reasons for considering He walked rapidly to be not from His walking was in a rapid manner but from He walked; his walking was in a rapid manner  $\rightarrow$  He walked, which was in a rapid manner. This source accounts for the absence of \*He falsely walked, \*He improbably walked, by the side of the extant He truly walked, He probably walked, He apparently walked. It is not that false cannot operate on He walked, as it does in That he walked is false, His having walked is improbable, nor that the word falsely cannot be formed, as it is

in *He claimed it falsely*. Rather, the secondary-sentence semicolon rejects, on grounds of extreme low likelihood, the combination *He walked; that he walked is false* (more precisely some *PAN* such as  $\forall is as a false thing$ ). Note that the unreduced combination can be said, for whatever it is worth; it is the reduction to *-ly* that is blocked by the low likelihood.

That the taking place of a reduction depends not only on the broad selection of the reduced entry but also on its high likelihood to its specific arguments can be seen in the following example: In *He farms extensively*, *extensively* is equivalent to, and can be considered to be reduced from, to an extensive degree as against just a little, or else from in an extensive manner, as against intensively, extensive being both a commonly-used degree-word and a commonly-used manner-word in farming. In *He writes extensively on this subject* we have *extensively* only from to an extensive degree. It is not that *He writes on this subject in an extensive manner* cannot be said, but that manner is not a sufficiently common noun on *extensive* as modifier of *write* to permit it to be reduced to *-ly* in this environment.

The subordinate conjunctions, e.g. because, when, providing, are obtained from operators  $O_{OO}$  on two sentences modifying their own first sentence:

He is late; his being late is because it is cold  $\rightarrow$ He is late, which is because it is cold  $\rightarrow$ He is late because it is cold

This applies also to conjunctional words when the second sentence is nominalized, as in *He is late due to its being cold* from *He is late; his being late is due to its being cold*. The conjunctional words are either *is Ving, is Ved* forms (e.g. *providing*, whence the *is* for the *which is* zeroing), or else historically derived from pronouns, prepositions plus nouns (e.g. *because* from *by cause*), and adjectives, so that there is no problem in relating them to the previously defined word-classes.

The derivation via *which is* provides precisely the shiftings of adverbs and subordinate clauses into various points of the primary sentence: it is the shift that occurs also for noun-modifiers, upon zeroing of *which is*. It explains how these are nested, each adverb referring to the verb or adjective.together with the intervening adverbs between itself and the verb or adjective. It explains also why adverbs of the verb (e.g. of manner: *rapidly*) are closest to the verb, while adverbs of the sentence (e.g. of fact: *probably*) and subordinate clauses are farther (except when separated by commas), and can comfortably occur before the subject:

Because it is cold, he probably is rapidly clearing the road.

(but not \*\* He is rapidly probably clearing the road).

In particular, it explains directly the various positions into which subordinate clauses can enter when there are three or more sentences involved:

He refused to go because they invited him only because they had to Because only because they had to they invited him, he refused to go

and so on. The derivation via *which is* also fits the interpretation of these sentences, with both the primary sentence above and the adverb or conjunctional clause being separately asserted: *He walks rapidly* asserts both that he walks and that his walking is rapid, whereas *His walking is rapid* does not quite assert that he actually walks.

There are various words which do not seem to fit the entry-requirement possibilities. Chief of these are the words which imply something not stated in the sentence (e.g. only, even), or which can only occur on conjoined sentences (e.g. either, both), or which look like conjunctions but can occur together with and (e.g. yet, therefore). None of these can occur in the first sentence of a discourse without requiring explanation. Like all other words which seem peculiar, these words can be obtained from the regular argument-requirement classes, by means of only the regular reductions of the language. The key in the case of these words is that they are  $O_{OO}$  (rarely,  $O_{nn}$ ) operators one or both of whose arguments has been zeroed on high likelihood grounds, either as being repetition or else as being non-specific.

For example, only, as in

(1) I told John, only he wouldn't listen and in Only John came.

If in the conjunctional case (1) the first argument-sentence is *Everyone listened* we obtain

(2) Everyone (else) listened, only John wouldn't listen

Such a first argument-sentence of *only*, which has *everything* where the second argument-sentence has a specific argument, and for the rest is the negation of the second argument-sentence, has especially high likelihood, because of the concessive meaning of *only*, and it can be said to be zeroable. If we zero it, we get

(3) Only John wouln't listen

where the difference in meaning of only as against the conjunctional only above is precisely that (3) contains the meaning of the zeroed first argument in (2). When and precedes only, as in I spoke to everyone and only John wouldn't listen the and connects I spoke to everyone to (2): it is a conjunction not on (3) but on the conjunctional sentence (2).

Next, except. We start with the conjunctional

John listened, except that it was all too strange

If the first argument-sentence, as with *only*, is the negation of the second except for *everything* in the position of some specific argument, we get, e.g.,

Everyone (else) listened except that John did not listen

Ordinary repetitional zeroing here yields

### Everyone, except not John, listened

Here the high-likelihood posited for *except* is the *not*, which can therefore be zeroed, yielding

### Everyone except John listened

All this does not occur if the first sentence does not have *everyone* or the equivalent:

Mary listened, except that John did not listen \*\*\*Mary, except not John, listened \*\*\*Mary, except John, listened

The surprising event here is the zeroability of *not*, but that is clearly due to its high likelihood after *everyone except*. The same development occurs for *but*. Under *but*, the zeroing of repetitions occurs even with specific arguments, not only *everyone*, but the zeroing of *not* is only with *everyone*:

Mary listened but John did not listen

- $\rightarrow$  Mary but not John listened
- (4) Everyone (else) listened but John did not listen
  - $\rightarrow$  Everyone, but not John, listened
  - → Everyone but John listened

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In addition, but admits the same zeroing of the first sentence as under only. Hence (4) also reduces to the rare (with full-stressed but)

But John did not listen

in the sense of Only John did not listen. If the not is in the first sentence rather that the second, we would get

No one (else, more) answered but three answered → None but three answered → But three answered

In this way

There were but three of us there

and

There weren't but three of us there

both come from

There were not any (others) there but there were three of us there  $\Rightarrow$  There were not any (others) but three of us there

zeroing the any (other), and either zeroing the not or not zeroing it.

More briefly, we consider so. The many uses of so can be obtained if we take them all as an  $O_{00}$ ,  $O_{nn}$  operator, roughly *in accord with* with a pronoun, say *that*, as its second argument. The different so are due to the different known uses of *that*. Thus in

I practiced quietly and so so did John do so so

The fourth so is in accord with that where that pronouns quietly (or: quiet manner), without whose presence in the first sentence, the last so couldn't exist in the second. The first so is in accord with that where that pronouns the whole first sentence:

and in accord with my practicing, so did John do so

The third so is in accord with that where that pronouns practicing, the nomin-

alized verb (with second argument, if any) repeated from the first sentence. The verb cannot be pronouned without its sentence being nominalized as the second argument of an aspectual operator do:

# I practice and John did his (or: some) practicing $\rightarrow$ I practiced and John did so

as though from

## I did my (or:some) practicing, and John did so (too)

where the my is not contrastive and therefore does not interfere with so (as also in Eisenhower led his party to victory and later Kennedy did so). More precisely, the second sentence must have been John did something which is in accord with that  $\rightarrow$  John did something which is so  $\rightarrow$  John did so. Otherwise, the nominalized verb would have been pronouned directly by that:and John did practicing too  $\rightarrow$  and John did that too. Also, the whole verb plus object together with its tense could have been zeroed as a repetition, yielding

## I practiced, and John too

Independently of how the verb of the second sentence is pronouned or zeroed, if it is at all, the second sentence can have a roughly adverb-of-sentence *in accord with that* where the *that* pronouns an argument (usually the first) out of the first sentence. When reduced to *so*, this usually moves to immediately before the second sentence, with the permutation of subject and tense in the second sentence that is associated with certain other front adverbs:

He studied architecture and so did she study architecture He studied architecture and so (too) she studied architecture He studied architecture and so (too) a bit of city-planning

This is the second so above, meaning here similarly to him, or in the last example similarly to architecture.

In all these cases of so the semantic effect and the correlation with what may or may not occur in either sentence, follows from the antecedent of *that* in each case. More generally, it is seen in such analyses that the peculiarities of meaning and of environment of words reviewed here follow from their source and their reductions, and that the various uses of each word, which may seem quite disparate, are obtained from a single source and not from an *ad hoc* assumption of different sources for the different cases. Certain other special words are discussed more naturally elsewhere: *the*, and quantifiers, in the noun-phrase, and *do* and the auxiliaries in the verb-phrase.

There remain several important and grammatically peculiar words, which have one property: they are part of the metalinguistic portion of a sentence. Every language has words for speaking about itself, and sentences can contain words referring to parts of the sentence (e.g. the latter). Certain metalinguistic operators have the special reduction from *that*, whether to colon, dropping the argument-indicator on the sentence which is their argument and about which they are speaking: I know that he is here  $\rightarrow$  I know: He is here. Of these. a few are zeroable, being reconstructible from the intonation: I sav, I ask, I request. English has three operators, and, or, not, whose sentences do not carry argument-indicators. This can be explained by their being not independent operators but parts of the I say operators: and, or from some such operators as I co-state, I state disjunctively (I offer a choice); not from I deny. Of course, these are largely artificial reconstructions from the common and, or, not. However, these three can be shown to be, in the grammar itself, operators (binary or unary) on sentences, not on words. They differ from other operators in not having any tense (operator-indicator) properties, and therewith not nominalizing their arguments at any stage of derivation. In addition, not has peculiarities of position among the words of its sentence. All of these situations, and others, are accountable for if they are taken as syntactically equivalent to what would be obtained if they were reductions from metalinguistic operators: I co-state  $S_1$ ,  $S_2 \rightarrow I$  say:  $S_1$  and  $S_2$ ; I state a choice of  $S_1, S_2 \rightarrow I$  say:  $S_1$  or  $S_2$ ; I deny  $S \rightarrow I$ I say: not S. Behind all this lies the fact that and, or, not are the three operators which are in effect identical as between language and set-theoretic systems. They are such because they are part not of the object language but of the metalanguage, of the speaking of the object language.

The other type of metalinguistic operator is that mentioned in fn. 1: appending to a sentence (via semicolon) the operator same, with entry-locations in that sentence as arguments of same. This same as such-and-such an entry is the sole equipment necessary to make all the instructions about repetitional pronouning and zeroing a part of the sentence in which the referential reduction occurs. Again, the reductions of course do not really go through such a secondary sentence. However the information about sameness which is necessary for these reductions has to be given, and because it is couched in words, and because it has to locate the entry in the sentence which cannot be done without citing the sentence, it is in any case *de facto* an appendage to the sentence in which the reductions are taking place.

## 3. The noun-phrase

'Noun-phrase', conventionally a construction containing a noun-word as

head, or substitutable for such, is an imprecise term. In the present theory, the morphological and local-syntax (e.g. plural, and relation to *the*) properties of nouns are found in the primitive arguments, but not in the non-specific N, such as *that*, *this*, *one*, *something* (which, though often called pronouns, are not replacements of any nouns). These properties are also found in certain operators which, because of their extreme durativity, are included in the domain of the reductions which lead to *-s* plural, *the*, etc. Thus *father of* and *fact* in *He is the father of 3 children*; *That she left is a fact* are operators ( $O_{nn}$  and  $O_{o}$ , respectively) no less than *He fathered three children*, *That she left is quite factual*.

On the other hand, the larger syntactic property of being an argument is common to the primitive arguments (nouns and non-specific "pronouns" but not operator-nouns) and to all operators (sentences) carrying argument-indicators, i.e. when they are operated upon by a further operator. It even applies to the arguments of and, or, not (or, rather, of their metalinguistic sources), which do not carry an argument-indicator. This does not mean, however, that the argument-sentences are noun replacements, for operators under which the sentences appear as arguments are in general different from the operators under which the primitive nouns appear as arguments. The argument-sentences are like the primitive-argument nouns only in being arguments- but of different operators. Morphologically and constructionally, that she left, for John to purchase books are in no way like noun-phrases. One form, John's purchasing books. is a bit like a noun-phrase in that John's is also a modifier in a noun-phrase, but purchasing books can hardly be fitted in. There are further forms of argumentsentence whose construction does indeed conform to noun-phrases, but each such form is a reduction from a noun modified by the given argument-sentence These are such forms as John's purchasing of books, John's purchase of books John's book-purchase, all of them with subject or object zeroable if they are non-specific or repetitions.

The passage from the not fully noun-like John's sketching trees to the nounlike John's sketching of trees is seen for example in

> I imitated the manner of John's sketching trees The manner of John's sketching is hesitant

where the of is not required, as against

I imitated John's sketching of trees John's sketching of trees is hesitant

in which the of is required, and which we can reach via manner of sketching  $\rightarrow$ 

Tsketching-manner  $\rightarrow$  sketching with zeroed compound-head -manner. The of completes the noun-phrase form of the nominalized sentence, because of trees looks like a modifier of a noun; this noun has to be understood as being not the Ving of sketching trees but the Ving of sketching of trees-e.g., it is only the latter that can be pluralized: His many (or constant) sketchings of trees, but \*\*His many (or: constant) sketchings trees. The argument here is that Ving is not in itself noun-like, but becomes so in the of-form, and that both the insertion of of and the change in Ving are due to the compounding of this Ving with a noun (e.g. manner) which is later zeroed.

Similar analyses show that there is grammatical reason for deriving, e.g. Your attention is required from Your state of attending is required and His attention was inadequate from His amount of attending was inadequate; and Alertness is required from One's state of being alert is required, His alertness was inadequate from His amount of being alert was inadequate. Thus also He is a teacher of physics is obtained from

- THe is a teaching-person of physics
- ← He is a person in the teaching of physics
- ← He is a person who is in the teaching of physics
- ← He is a person; the same person is in the teaching of physics

where the teaching of physics is obtained from one's teaching of physics by zeroing of the non-specific subject. And The walk was too long is obtained from

- The walking-piece was too long
- ← The piece of walking was too long
- ← The piece of one's walking was too long
- ← The piece was too long; one's walking was in a piece

The suffix, as in -er, or the zero, as in a walk, sketching of, are reductions of the person, manner, state, amount, piece, etc. which were the head of the Ving-compound noun. It is therefore not surprising that the operators and modifiers in these can be selected by the zeroed head noun as well as by the V. Thus a poor teacher of physics is either from a person who is in poor teaching of physics or from a poor person who is in the teaching of physics; a quick walk is from a piece of quick walking, while a short walk is from a short piece of walking.

Full nominalization of sentences and of operators is thus obtained from nouns that have as modifiers those sentences (which necessarily carry argumentindicators, but are not themselves fully noun-like). The noun-phrase is built up from nouns by addition of modifiers, conjoined segments (and N), quantifiers, and some special affixes. All modifiers are secondary sentences (under semicolon) which have undergone wh-pronouning and have thus become relative clauses. Modifiers of the noun arise when the wh-pronouned argument in the secondary sentence (as well as its antecedent in the primary) is a noun:

A man rushed up; the man seemed angry

 $\rightarrow$  A man rushed up, who seemed angry

 $\rightarrow$  A man, who seemed angry, rushed up

Similarly A man, whom we thought deranged, rushed up from A man rushed up; we thought that man deranged.

In most relative clauses with is, the which is, who is can be zeroed. When the residue after this zeroing is PN (with not more than one or two left-modifiers on the N), or certain A (including adjectives formed from other words), the N (with zeroed P) and A can permute to before the host (i.e. the antecedent of the which, who), thus becoming "left-modifiers." If the P is for or the like in the sense of especially for, characteristically of the permuting N forms a compound with its host:

> The ballot-box is empty ← The box for ballots is empty ← The box which is for ballots is empty.

Compounding also occurs from Ving PN as in book-burning, and APN as in stone-gray. If the position of P here is occupied by is of the type (or: class), is called, or the like, the N permutes without the compound stress pattern:

A Ming vase broke ← A vase of the class Ming broke ← A vase which is of the class (or: period) Ming broke

In the case of A, the permuting is required:

A small vase broke ← A vase which is small broke

When a noun already has one or more modifiers, any further secondary sentence which becomes a relative clause operates on, and thus speaks about, the noun as already modified. And when it is permuted, this further relative clause is permuted to after or before the noun with the modifiers already next to it. Hence the later modifiers, which necessarily present properties of the noun as already modified, are farther from the noun than the previously-entering modifiers. This creates an order of modifiers, especially clear when all the modifiers are on the left, in which the modifiers nearer the noun are its more durative or essential modifiers (especially those which are themselves nouns) and the ones further out are less and less so. Thus (1) He has a new red car  $\leftarrow$ He has a red car, the same red car is new, while (2) He has a red new car  $\leftarrow$ He has a new car; the same new car is red. Preferred orders arise, since (1) speaks of a new case of red cars, while (2) speaks in the less likely framework of a red case of new cars.

When the residue of zeroed which is, who is is a noun (without P), it does not move leftward, and is then said to be in apposition to its host:

My friend, who is an Ambassador, returned  $\rightarrow$  My friend, an Ambassador, returned

In the relative clause, there is the well-known distinction between the nonrestrictive case

A (or: the) man, who seemed angry, rushed up

and the restricted case

A (or: the) man who seemed angry rushed up

The difference in meaning is that in the restrictive case the man's anger is known before his rushing up. As to form, the problem is to explain the loss of the comma. In the present system, the non-restrictive is obtained from

A man rushed up; the man seemed angry

and the restrictive from

One rushed up; the same one is a man; the man seemed angry

 $\rightarrow$  One rushed up, the same one is a man, who seemed angry

 $\rightarrow$  One, who is a man who seemed angry, rushed up

The comma in the *man*, *who* relative clause is reduced when that becomes part of the further relative clause with *one*, *who*; and the zeroings of *which is*, *who is* and of the non-specific *one* (with its comma) are well-established reductions. The meaning of the restrictive clause is thus due to the fact that *seemed angry* joins *man* before *man* (with its attached *seemed angry*) joins *rushed up*. As to the definite article. This is a late development in the languages that have it, and is in general historically derived from demonstrative pronouns. In the present theory it is obtainable by well-established reductions from a restrictive relative clause containing the apposition of a noun-phrase to the non-specific noun *that*:

Something fell; the same something is that; that is a box

 $\rightarrow$  Something fell; the same something is that, which is a box

 $\rightarrow$  Something fell; the same something is that, a box

 $\rightarrow$  Something, which is the box, fell

 $\rightarrow$  The box fell

The comma after *that* is lost when *that* itself enters as a relative clause under *something*. Here the only new step is the morphophonemic reduction of commaless appositional *that* to *the*. It turns out that the referential, generic, and unique uses of *the* are all among the uses of non-specific appositional *that*, so that there is no need to posit different *the*—or different *that*. This derivation explains many properties of *the*. For example, *the* is insistently first of the noun-modifiers simply because it is in apposition to the noun with all its modifiers. Also, a noun with *the* cannot become a left modifier, although a noun with modifier can: a trip in a heavy truck  $\rightarrow$  a heavy-truck trip but a trip in the truck  $\neq$  \*\*a the-truck trip. This analysis explains why \*\*A fact is that she left whereas there exists The fact is that she left. The reason is that fact is itself an operator, is a fact, rather than a primitive argument. Hence, while we do not have A fact is . . . (except when zeroed from Having a fact is . . ., etc.), we do have That is a fact. We form:

> <sup>↑</sup>Something is that she left; the same something is that; that is a fact →<sup>↑</sup>Something is that she left; the same something is that, a fact →<sup>↑</sup>Something, which is the fact, is that she left → The fact is that she left

We also see why there is no \*\* (1) A mammal is a dog (except in a special sense) whereas there exists A dog is a mammal and The mammal is a dog. Given that is means is the same as and is a case (or: member) of, we have no (1), but we can have That is a dog and That is a mammal, from which we can get That, a mammal, is a dog, whence the. Note also that operators on the N can be selected either by N or by the: thus in The family doctor knows his patients the operator is clearly in the selection of doctor; but in The family doctor is fast disappearing the operator refers to that, in the sense of that thing, that type, which becomes the.

As to the quantifiers, some, many, all, etc. They present problems because they seem to be left-modifiers, yet some of them do not occur naturally in relative clauses (e.g. all books, \*books which are all); also some of them have adverbial as well as adjectival features. In the present theory, some of them can be obtained as non-specific nouns in close apposition like the: e.g. Some young man came  $\leftarrow$  Some came; some were young men. Others are obtained by an operator on the and of N and N, whence also their adverbial features. Thus it may be that Few men came, Three men came should be obtained as follows:

> ↑*A* man came and a man came, amounting to few (or: three) →↑*A* man and a man, amounting to few (or: three), came → Men, amounting to few (or: three) came → Few (or: three) men came

The operator *amount to* helps explain the scale construction (*It is 5 feet high*, etc.). And operating on *and*, it yields a source from which the plural suffix can be obtained:

TA stone fell and a stone fell, amounting to a (or: some) number  $\rightarrow$ TA stone and a stone, amounting to a number, fell  $\rightarrow$  A number of stones fell  $\rightarrow$  Stones fell

This derivation yields the indefiniteness of the plural from the indefiniteness of the operator on the *and*, and it yields the fact that there must be more than one from the *and* in the operand. The reduction from N and N to N plus plural does not require an operator on the *and*; we have *one and a half pints* from *one pint and a half (of a) pint*; it is the indefiniteness of the plural that does. The object of *amount to*, later zeroed, could be *some*, or a comparable indefinite, rather than *a number*.

Genders and case-endings hardly exist in English. Case-endings (and in some languages prepositions in VPN) are argument-indicators showing the argumentposition of a noun in respect to its operator. Different operators may impose different case-endings upon, say, their second argument; this may be looked upon as being a classificatory part of the operator without being an independent entry. There may also be a particular operator whose second argument takes either, say, the accusative or the genitive, usually with different meanings of the operator. In such cases, it may be possible to show that all arguments has been zeroed. One such situation is *He taught physics to the freshmen*, by the side of *He taught the freshmen*, which we can obtain by zeroing from

*He taught something to the freshmen*. If such zeroing is impossible, the deviant argument-indicator has to be viewed as containing a new operator.

In cases where arguments can take, say, a masculine or a feminine affix depending on whether a male or female is meant, the gender affix is the equivalent of an entry, a reduced word stating that the argument in question is male or that it is female. In cases where different arguments receive different genders, the genders are classificatory parts of the argument-words (like certain case-endings, above) without being independent entries, either operator or argument. Arguably, these classificatory portions can be looked upon as phoneme sequences which do not quite have syntactic status-more of a status than *sl-*, *gl-* in English words, and differently than *per-*, *con-*, in *perceive*, *conceive*, but nevertheless not quite entities of the syntax.

The count-noun property in English, while complex in domain and in environment, is analyzable as a gender of the latter type. It is a requirement of a proclitic a on nouns of a subset unless the N carries *the*, etc., or certain quantifiers, or is in certain second-argument situations.

Certain languages have concord in respect to gender, case, plural, between nouns and certain operators on the nouns, especially when the operators appear as modifiers on the nouns. This involves no more than morphophonemics, the locating of phonemic segments depends on the occurrence of the affix in question on the noun.

Finally, the referential pronoun *he*, *which*, etc., are not entries but reductions, made possible by the metalinguistic operator *same*.

### 4. The verb-phrase

The term verb-phrase usually refers to the non-nominalized operator, with its tense, certain special operators on it, its complements (i.e. complex second arguments), and its modifiers.

As was noted above, a fixed set of operators, which have a generally less durative character, receive the operator-indicator -s directly, and are called verbs. The others have the operator-indicator preceding them, carried by be. Thus they have the appearance of a two-word verb phrase: be angry, be up, be a father of, be a fact.

The characteristic element is the tense. It would have been possible for the tense to be a reduction of *now*, *in the past*, etc. However, it turns out that both grammatically and semantically, at least in English, the tense on an operator is equivalent to a reduction of time-order conjunctions, i.e. *before*, *after* in respect to another operator in the sentence: it expresses the time order in respect to another verb. This is visible in *He had spoken to her before she left*, *He planned that he would speak to her*. But in each sentence there remains at least one verb which has no further verb to which is can be time-ordered, unless

we appeal to the metalinguistic I say, I ask, etc. which can be presumed to exist on every sentence and to have been zeroed. The time-order of these verbs in respect to the I say, I ask is equivalent to the usual meaning of "past," "future" in respect to the speaker's "subjective" tense. However, claiming that -ed comes from before my saying this is equivalent to claiming that it means 'before the speaker's speaking'. The difference is that in the former the information about the speaking of a sentence is included in the sentence itself, something which is made grammatically possible by the likelihood-zeroing, and which then simplifies many things in grammar.

The syntactic status of the tense is problematic. It can best be treated, especially in English, by saying that the base tense is simply the operator-indicator, which is only vaguely time-specific: -s is used for present (i.e. same time as the speaking), for timeless (two plus two equals four) and all-time (He's always late, though he happens to be on time today), for past and future in certain conditions (Then Caesar says to Anthony . . .; I go tomorrow). Although the other tenses also have ranges of meaning, including evidential rather than temporal, they are more time-specific, and can well be considered equivalent to before, after in respect to other verbs of the sentence. Since these tenses appear as replacers of the present-tense operator-indicator, the simplest way to obtain them is to say that on a given verb  $-s \rightarrow -ed$  before which is before, and  $-s \rightarrow$  will before which is after, much as whether N tense  $V \rightarrow$  :tense NV? after I ask. Then the which is before (or: after) is zeroable, as being the unique (hence maximally likely) modifier of the verb after -ed, will respectively.

Then the source of He plans that he will speak to her is

*I* say he plans his speaking to her; his speaking to her is after his planning

 $\rightarrow$  I say he plans that he will speak to her, which is after his planning  $\rightarrow$  He plans that he will speak to her

And for He plannned that he would speak to her, starting with the above result:

\*I say he plans that he will speak to her; his planning that he will speak to her is before my saying this

 $\rightarrow$  I say he planned that he would speak to her, which is before my saying this

 $\rightarrow$  He planned that he would speak to her

Thus the -s has various time-meanings, but involves no conjunction to anything else. In contrast, the -ed, will arise on a verb when it is under a timeorder conjunction to another verb. Note that the -ed is placed not only on the

operator in question but also on any tense that had already been established in respect to that operator. This is a source of the double tenses, such as *would*.

Deriving tense from the time-order conjunctions before, after, explains the relation of time conjunctions to a little-understood tense-related element: aspect, i.e. grades of durativity and the like. Within the verb set proper, some are relatively durative (sleep) and others momentaneous (arrive). Under timeconjunctions, only certain ordered pairs of these occur. E.g. John slept until Tom arrived, but \*\* John arrived until Tom slept (except for "kept on arriving until Tom fell asleep"). These distinctions come out naturally if we say that between the tensed verb and the time-conjunction there is an intervening operator of duration, mostly moment, period:

# John slept throughout the period (lasting) until the moment at which Tom arrived

This is not to say that one cannot say sleep at a moment, arrive throughout a period, a moment (lasts) until a period (whatever that means) or a period (lasts) until a period. But these combinations are far less likely than sleep throughout a period, arrive at a moment, a period (lasts) until a moment, so that only the latter are zeroed, whereas there is no zeroing in:

# John arrived throughout a period lasting until the moment at which Tom slept

Under certain operators, the argument sentences (under  $O_{OO}$ , the second one) are necessarily later in time than the higher operator: *I want that he should* go, *I order that he go*. Under these operators, the future tense which the argument-sentence would carry in respect to the operator on it is zeroed as being most likely, or reduced to *should*. This is the subjunctive in English:  $\neg I$  order that he goes; his going is after my ordering it.  $\rightarrow I$  order that he will go  $\rightarrow I$  order that he go.

We next consider the special operators such as the auxiliaries. We begin with operators on a sentence: John knows that Mary is on time, John expects Mary to be on time. If the argument sentence is subjunctive, in the N to V form, then its subject is zeroable if it is the same as the preceding subject of the higher operator: John expects to be on time  $\rightarrow$  John expects himself to be on time. For some higher operators this sameness of subjects is usually the case: John tries to be on time; though it is possible to have also John tries for Mary to be on time; something which is less unusual in other languages, e.g. with French essayer. Now, the English auxiliaries, as in He can be on time, seem to be something else again, since they are unthinkable with a different

second subject (\*\*He can for her to be on time), so that they seem to be a new grammatical entity: a pre-posed tense-rejecting operator on the verb. Historically, these are past-tense  $O_{no}$  verbs which were not necessarily restricted to having their own subject repeated in their argument-sentence. They reject a tense because they already contain a tense, even though they are not felt as containing a tense, because by their meaning the past-tense verb ('had the ability, the possibility,' etc.) reflects upon the present situation. The required zeroing of to (as in \*\*He can to be on time) is not unique to them, occurring also in let go, make him go. And the fact that the auxiliaries are not a new grammatical category but simply the resultants of several reductions together is seen in the existence of a number of near-auxiliaries which have only some of the reductions, e.g. dare, need, ought. However, one might think that even though the auxiliaries are historically the product of reductions from Ono (and in part  $O_{nn}$ ) verbs, they have now entered a new syntactic status of being operators on a verb alone and not on a sentence. In considering this possibility, we must ask what happened to the ancestor of, say, *can* in the sentences where it cannot now be used. First the fact that the tense is inseparable in the auxiliaries can be used to explain why they do not occur with other tenses, or under to and -ing. But they did occur there, indeed up to Middle English. And when they dropped from use there it was undoubtedly not that the sentences ceased being said but that can, etc., were replaced there by other "competing" words. These replacers, to be capable of, had been able to, knowing how, etc., remain as complementary variants of *can* in those positions, and occasionally as free variants of *can* even in the positions in which *can* occurs today-visibly so in parallel sentences (He can work, and will remain able to do so). When we consider the possibility of can before a verb with a different subject-different from that of *can*-it is hard to imagine how even the replacers of an earlier, more fully occurring, ancestor of *can* could occur in such a position: e.g. ? He has the ability for his group to play Bach. But even if the latter is excluded, it is excluded on the basis of meaning, not of gross grammatical structure. And if can is a suppletive variant of such words, then it is not grammatically excluded from the set  $O_{no}$ , the set of verbs whose object is a sentence. Of course, the specialized shape of the auxiliaries goes uniquely with their special environments; but we can say that this is a product of special reductions, and that it does not violate the types of entry requirement found in other operators of the language.

The difficulties with do are quite different. Chiefly: When its object is a nominalized verb or sentence, do is an  $O_{nn}$  operator of minimal meaning (as in *do the dishes*, *do a jig*): *do book-binding*, *do the job of binding of books*. When it occurs as an apparent pro-verb, it is really the same  $O_{nn}$  used to circumvent the fact that pro-wording (especially the *wh*-pronouns) is available

only for nouns. Hence in What will he do, oppose it? and What he will do is oppose it (or What he will do is to oppose it) the underlying form is "He will do the act of one's opposing it, "He will do the act which is for one to oppose it or the like, a form which is gone through this time not by the grammarian but by the language itself, i.e. by its speaker's regularities—in order to be able to pronoun the act of one's apposing it by what. And in the did of What did he do (the future of which is will and not will do), the do is the carrier for the tense affix which has been permuted away from its moorings, just as is the be in He is glad.

It is thus possible to analyze do and the auxiliaries without resorting to new or restricted types of entry-relations. In contrast, the details of occurrence for will (as against the regular verb wills) show that it is no longer simply a variant of  $O_{nO}$ , from which it is historically descended, and is syntactically a tense, i.e. an operator-indicator replacement under the conjunction  $(O_{OO})$  after.

There are cases of operators which seem to have become tense-like, but not on closer examination. If we take He has spoken as equivalent to a reduction of *He has the state of speaking*, then has is the regular verb meaning 'to hold, to contain' which when used of situations means that those situations are completely extant and not merely emergent or continuing: e.g. in a person having a given age, or having an understanding of a problem, or having little Latin. The suffix -en/-ed, which has complex historical origins but is different from the past-tense -ed, appears from earliest times in the sense of 'provided with, in the state of (having)' as in toothed, moneyed, and is found in the English perfect 'a complete (or: completed) state of as in He has spoken, He has bought it, and in the passive, where the object of the verb is stated to be the recipient of the state engendered by the verb (The box was lifted  $\leftarrow$ <sup>7</sup>The box was in the state of the lifting of it). If we take the -en/-ed as not merely meaning 'completely extant state' but as being syntactically equivalent to a reduction (via a compound) of some such word as state in this sense, then in terms of the present theory the perfect-form He has spoken is obtained from 'He has a state; His speaking is a state  $\leftarrow$ <sup> $\uparrow$ </sup>He has the (complete) state of speaking.

With somewhat less difficulty we can obtain the progressive *He is speaking* from *He is in the process of speaking* (or some other word instead of process, as in *a-hunting* from *on hunting*), from *He is in a process; (his) speaking is a process* (or: *is in process*). In both perfect and progressive the syntactic statuses can still be taken as *has a state, is in process* with a sentence (of zeroable subject-same or indefinite) as argument of *state, process* in a secondary sentence.

We next consider what are called verb-complements to see if they present difficulties to the entry theory. By this theory, the arguments of an operator can only be some sequence of N and O, with the O carrying its own arguments

with it (hence being a sentence). For many verbs this description is adequate without further ado. Under some verbs, reductions can take place. Thus under consider we have that this is adequate  $\rightarrow$  this to be adequate  $\rightarrow$  this adequate. Under all verbs whose object is subjunctive (i.e. later than the operator) we have that he (should) go  $\rightarrow$  (for) him to go, (I order that he be shot  $\rightarrow$  I order for him to be shot). And a few verbs which do not have a subjunctive object have a subjunctive-like form which may be a variant of it: He saw it go, He watched it go, He made it go, He let it go. Finally, there are a few verbs whose argument sentence has a unique reduction in form. They prevented his going, They prevented him from going; and so for prohibit. We cannot say that the fuller form is from They prevented him from his going because there is no They prevented him (except as zeroed from They prevented him from doing something). All these object-forms are variant forms of a single sentence as object.

However there are in addition certain complicated objects (or"complements") which have the property that their first part, noun or nominalized sentence, is one which can occur independently as object of the given operator: e.g. I command him to go (not I command for him to go) by the side of I command him; This protects the equipment from breaking by the side of This protects the equipment; I set the mechanism (to) going by the side of I set the mechanism; He caught the children stealing by the side of He caught the children. This condition is not met by the single-sentence variant forms above, where one could say Reading makes time fly but not Reading makes time, and I know vacuum to be irrelevant here but not I know vacuum. It is therefore possible to analyze the latter, complicated, objects as being two arguments, a noun or nominalized sentence plus a sentence whose subject is that noun: I command him that he go, This protects the equipment from the equipment's breaking, and so on. The operators are thus  $O_{nno}$ . This does not mean that we have a restriction on the arguments, with the subject of the O required to be the same as the preceding N object. The O argument can be independent of the N argument which precedes it: I command him that the lawn be cleared, This protects the equipment from people's making mistakes. Only then there is no zeroing.

As in the case of the noun-phrase, the verb-phrase, which consists first of all of an operator with its objects which may themselves be sentences (operators with their arguments), can be extended by modifiers derived from secondary sentences, via relative clauses. With the zeroing of *which is*, these modifiers become adverbs of the verb, adverbs of the sentence, and subordinate clauses. Some of the reasons for deriving these from relative clauses on the verb or sentence, and some of the nesting and other properties of these modifiers which follow from this derivation, have been mentioned in the discussion of word classes.

The entry theory has no provision for subsets of operators, other than by their argument domains. Such subsets as exist in the grammar are due to conventions of likelihood-based reductions. For example, the reciprocal verbs are simply those verbs after which *each other* is zeroable. It is not the *each other* that is special: For all verbs in which some of the words that occur in subject position can also occur in object position, the pronoun *each other* can arise: John saw Mary and Mary saw John  $\rightarrow$  John and Mary saw each other. For some of these verbs, given  $N_1VN_2$  the likelihood, or implicitness, of a following and  $N_2VN_1$  is exceptionally great: John met Mary and Mary met John  $\rightarrow$  John and Mary met John  $\rightarrow$  John and Mary met each other, and so for fought, conversed, etc. Under just these the *each other* is zeroable, yielding John and Mary met. Some of these verbs also occur as intransitives, with only one argument; in which case an ambiguity can arise: John and Mary fought can be zeroed from John and Mary fought each other, but also differently zeroed from John fought and Mary fought.

5. Question, imperative, negation.

These three are altered sentence forms which present varied and peculiar difficulties for grammatical description. In the present theory they are obtained, in two different ways, from metalinguistic operators on the sentence.

First, every question sentence can be obtained by established types of zeroing from a disjunction of sentences which cover the domain of possible answers: Will he leave, or stay?  $\leftarrow$  Will he leave or will he stay? And Will he leave?  $\leftarrow$ Will he leave, or not?  $\leftarrow$  Will he leave or will he not leave? That the answers are really selections from among the disjuncts can be seen in the following example: If one person asks a second Did you close the door? and the second thereupon closes the door and then answers yes (or: Yes, I did, Yes, I closed it, etc.), then the second has not answered truthfully, But if after his belatedly closing the door he merely says I closed the door he speaks truthfully, if with some dissembling. It follows that yes does not merely repeat (or agree with) the words of the question, but is a referential to it, containing the -ed of the question as obtained from before my asking this, not simply containing a new occurrence of -ed on close.

Secondly, the disjunction in question is an argument of ask whether, wonder whether, etc.: He wondered whether she would go or not, He wondered: Would she go, or not? When we bring in the ask, whether, we see that the wh questions too can be analyzed as disjunctions: I ask whether  $N_1$  will go or . . . or  $N_m$ will go  $\rightarrow$  I ask whether  $N_1$  or . . . or  $N_m$  will go  $\rightarrow$  I ask who will go  $\rightarrow$  I ask: Who will go?  $\rightarrow$  Who will go, I ask.  $\rightarrow$  Who will go? The set  $N_1, \ldots, N_m$  covers the possible answers either by a list if available, or by indefinite pronouns over the domain (e.g. one or another or yet some other). Once the whether is replaced by interrogative intonation, the higher operator becomes available for zeroing. The zeroing applies not to wonder, or to John asks or to I asked but only to I ask(you), which has the informationally unique property of being performative. In this way, all the question forms are found to be grammatically similar, and to be derived from assertions—but assertions which pose a disjunction over the possible answers.

In a parallel way the imperative form is obtained from an assertion: I request (of you) that you please stay  $\rightarrow$  I request (of you): Please stay!  $\rightarrow$  Please stay!

Negation presents various difficulties to grammatical regularity. The difficult forms can be obtained if we derive *not* in a sentence from a metalinguistic I deny (without the argumentative nuance of deny) on that sentence, much as interrogative intonation is obtained from I ask:

I deny he will go  $\rightarrow$  I say he will not go  $\rightarrow$  He will not go, I say  $\rightarrow$  He will not go

Whereas the interrogative intonation is placed over the whole first disjunct in the object of *I ask*, the *not* is placed in modern English before the operator in the object of *I deny*: He will not go, He is not angry. This derivation explains why not, like and, or, question, and imperative, does not impose an argumentindicator on its sentence. It also avoids our having assertions about the null set: in Nothing happened  $\leftarrow I$  deny something happened we don't have an assertion about nothing but a denial about something. It further avoids deriving a sentence from an assertion made and then retracted: No man came is not from \*\*A man came; the same man was none but from I deny a man came.

Different placings and problematic occurrences of not are due to the denial being on different components of the sentence. Thus Not fully tested material is dangerous is from Something is dangerous; the same something is material; I deny the material is fully tested. And He didn't arrive at 3 is from I deny on He arrived; his arrival was at 3, while He didn't arrive until 3 is from I deny he arrived  $\rightarrow$  I say he did not arrive  $\rightarrow$  He did not arrive to which is connected a secondary His not arriving lasted until 3. The pecularities of negation in respect to quantifiers stem in large part from the comma-less appositional status of quantifiers. Thus All patients are not alike can be obtained from I deny all are alike; the same all are patients, while Not all patients are alike is from Some (things) are alike; I deny the same things are all patients.

The utility of deriving not from deny is seen, for example, in the use of any, ever. When these words occur without negative or primitive words they mean roughly 'each', 'at each time', 'each choice of': He is willing to talk to

anyone parallel to He is willing in each case to talk to someone; He is ever helpful. Their apparent negative meaning arises when they are modifiers on verbs like regret, fail or on deny: if for each case one denies something then that something is available in no case. Thus I deny for each case that he talked to a person  $\rightarrow$  He did not, for each case, talk to a person  $\rightarrow$  He did not talk to any person. The various uses of any, ever are obtained from a single word for each, with a single meaning, differing only by its point of entry, i.e. by the sentence component on which it acts.

6. Passive and other permutations

Various transformations which contain apparent permutations turn out to be the products of processes other than permutation. In the case of the passive the English analysis, which may differ from that for some other languages, is as follows:

That the passive is not simply an independent shifting of words is clear from the fact that the components of the passive are all well-known otherwise in English grammar. The by plus subject occurs as one form of sentence nominalization, as in *the chopping of trees by settlers*; the *-en/-ed* occurs as an adjectivizing suffix on verbs and on predicate nouns (*is gone, has gone, is twofisted*). Also, the passive has the nuance of completedness which is associated with these occurrences of *-en/-ed*. The only way to utilize these otherwise existing elements in the derivation of the passive is to begin with a source:

> <sup>†</sup>The trees were in a state of the chopping of trees by settlers  $\rightarrow$ <sup>†</sup>The trees were in a state of (the) chopping by settlers  $\rightarrow$  The trees were chopped by settlers

Thus *trees* in the passive is not a permuted object of *chop*, but the subject of *is in a state*, with the object of *chop* being zeroed as a repetition of the new *trees*. The reduction *in a state of Ving*  $\rightarrow$  *Ven/ed* is the same as in the perfect *has chopped*, and as in *in a state of having*  $N \rightarrow Ned$  (as in *He is hard-headed*).

This analysis allows for the many Ven words whose subject has not been permuted: We are agreed  $\rightarrow$  We are in a state of our agreeing, and so for They are rested, He is finished with it, He is opposed to it, The season was far advanced, She is improved, etc. It also fits the passive adjective with zeroed indefinite agent The jar came broken  $\leftarrow$  The jar came in a state of the breaking of it by something; and cases of dubious passiveness: A kitten is born with its eyes closed  $\leftarrow$  A kitten is born with its eyes in a state of their closing (since no one closed them).

The syntactic status of the -en/-ed as a reduced operator (state) is seen

in cases where it has its own modifiers. Thus the freshly isolated heart does not come from Someone freshly isolated the heart, since freshly is not used as an adverb on to isolate. Rather, it comes from The heart is freshly in a state of the isolating of it by someone.

Different evidence comes from the fact that the likelihood of making a passive for particular words depends on the likelihood of having an operator such as state. Thus from He left his wife one can have the passive His wife was left by him  $\leftarrow$  His wife was in a state of the leaving of her by him. But from He left the United States it is far less likely to say \*The United States was left by him, because there is no recognizable state such that the United States would be in it as a result of this event. However, we can say The United States has been left by many of its best writers, because this situation is large enough to be viewed as a state of the country. This analysis also explains the unlikelihood of a passive for The dog ceased its barking, and the like.

A different kind of apparent permutation is presented by sentence forms such as in A brick is what cracked the glass, The glass is what the brick cracked, What cracked the glass was a brick, etc. Conveniently, these have parallel forms A brick is that which cracked the glass, That which cracked the glass was a brick. Here a two-sentence source is clear:

- A brick is that; that cracked the glass
- $\rightarrow A$  brick is that which cracked the glass
- $\rightarrow A$  brick is what cracked the glass That was a brick: that cracked the glass
- $\rightarrow$  That which cracked the glass was a brick
- $\rightarrow$  What cracked the glass was a brick

It is thus not necessary to derive these sentences from permutation and insertion of is what, etc., but simply from joined sentences containing non-specific that.

# 7. Conjunctions

Two conjunctions, and, or, are different from all others in that they do not impose argument-indicators on their two sentences, and in that they permit the zeroing of words in the second sentence which are the same as parallel words in the first. The lack of argument-indicator can be obtained by deriving these words from metalinguistic operators as noted above.

> I costate that John left, Mary stayed  $\rightarrow$  I say: John left and Mary stayed

 $\rightarrow$  John left and Mary stayed, I say

- $\rightarrow$  John left and Mary stayed

The and is thus a residue of a particular metalinguistic operator, like the not, the interrogative intonation, etc. This analysis requires that all occurrences of and be derivable from and between two sentences, something which is independently demonstrable. Thus and between two nouns is usually the result such as the reciprocal are differently derivable from and on two sentences: John and Mary met ← John and Mary met each other ← John met Mary and Mary met John. Certain cases of and which do not come from parallel zeroing have other inter-sentence sources. Thus Gilbert and Sullivan wrote operettas should not be derived from Gilbert wrote operettas and Sullivan wrote operettas (differently from Mozart and Beethoven wrote operas). But it can be derived from The team of Gilbert and Sullivan wrote operettas  $\leftarrow A$  team wrote operettas; the team includes Gilbert and the team includes Sullivan. Similarly for Sugar and water makes syrup  $\leftarrow A$  combination makes syrup; the combination includes sugar and the combination includes water (note the singular makes whose subject is combination). The zeroing of team, combination in these environments is a special case of the zeroing of non-specific nouns such as something, that.

The comparative forms, with their well-known peculiarities, can be most regularly obtained from a sequence of three sentences separated by semicolons, which have certain expected word-repetitions, and one of which has more than, less than as operator. For example

> <sup>\*</sup>Men read books; the men are more than (other) men; the (other) men write books

 $\rightarrow$  Men read books, who are more than (other) men who write books  $\rightarrow$  More men read books than write them

The expected word-repetition leads to a required zeroing of the object of more than: in this case (other) men who.

> "Men read books; the books are more than (other) books; women read the (other) books

- $\rightarrow$  Men read more books than (other) books, which women read  $\rightarrow$  Men read more books than women read

When what is compared is degree of an operator (adjective, verb), rather than an argument (noun), the source includes degree or amount, since the operator would not be a direct argument of more than:

- <sup>†</sup>Men are tall to a degree; the degree is more than another degree; women are tall to the other degree
- → Men are tall to a degree which is more than the degree to which women are tall
- $\rightarrow$  Men are taller than women (are)

Here the required zeroing is on the second *tall*; and *to a degree which is the degree to which* are zeroed as being special cases of *that which is*, this special case being unique to the *more than*, *less than* sentence sequence.

If the more than sentence is first of the three, no special zeroings arise:

Some are more than others; some are men; the men read books; others are men; the men write books

- $\rightarrow$  Some, who are men who read books, are more than others, who are men who write them
- $\rightarrow$  Men who read books are more than those who write them

A companion form is

There are more men who read books than (who) write them.

### NOTES

1) Referential pronouning and zeroing can be determined in each sentence on the basis of information known otherwise to the speaker. However, if one wishes, the required information can be given in the sentence itself.

Sentences can contain words which refer to locations in the sentence (but not to the not-yet-completed sentence as a whole): e.g. *latter* (as in *He prefers Mozart to Bach, but I prefer the latter*). If we have a sentence in which referential pronouning or zeroing has occurred, we can replace that activity by an operator *same* whose arguments are locations in the sentence, i.e. entries into it. Thus, given *John came and then went* and *John came and then he went*, from *John came and then John went*, we can reconstruct (for Tsee below).

John came and then John went; the (first) argument of the second argument is the same as the (first) argument of the first argument

Here the permutations and reductions described in I.3 enable us to form

Vohn came and then John, who is the same as the argument of the first argument, went reducing to

John came and then the same (or: that) John went

reducing to

John came and he went John came and went

In this way, the information about sameness which must be stated externally about a sentence, in order to account for its referentials, can be stated in the sentence itself, at the cost of allowing one component sentence, the one stating sameness, to have as its arguments entries into other component sentences.

2) \* is used here for very unlikely, but not explicitly ungrammatical, sentential word combinations. \*\* is used for forms that violate entry and reduction rules.  $A \rightarrow B$  is used specifically for 'A reduces to B'.

3) In addition to reductions, languages may have morphophonemic variants unrelated to likelihood.

4) More detail is given in the writer's Grammar of English on Mathematical Principles, New York, Wiley and Sons, forthcoming; also On a theory of language, The Journal of Philosophy 53 (1976) 253-276.

5) See II.4 below. Details in the writer's Notes du cours de syntaxe (Maurice Gross, ed.), Éditions du Seuil, Paris 1976, pp. 158-181.

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