

III The reductions (Elementary paraphrastic transformations)

0. These are, generally, reduced phonemic shape or distance which an operator or its argument may optionally (in a few cases, requiredly) take when the operator enters upon that argument to make the resultant sentence. There is no ordering of the reductional variants other than that due to the arising of the conditions needed for the variant. Roughly, we can say that the reduced shape is available to operators (or arguments) whose informational contribution in respect to its argument (or operator) is reduced. Their informational contribution is related to their relative likelihood, i.e. their selectional properties, and to their relations of occurrence in respect to the operators and arguments which have entered up to that moment. Since these properties differ among the words of an operator set, the availability of a variant for some words of the set and not others involves the imposing of a restriction on the set of unrestricted operators: namely the boundary of the subset which can take the variant.

1. Many-one variants.

1.1 Pronoun For Repetition.

On any operator X with two or more arguments there may appear a meta-discourse operator argument 1.n has same word (or: referent) as argument 2.m, where n, m are addresses in arguments 1 and 2 respectively; the addresses are necessarily the identifications of the ordered operator-entry of the given word into the sentence. This operator enables the word at either address to take a pronoun as replacement or addition. We can consider that the meta-discourse operator can move to right after either of the addresses mentioned in it (III 2.4). Then, if the operator states same instance (or referent) it is replaced by an adjectival pronoun (e.g. the, that): Some water spilled and I wiped up some water with argument 1.1 same instance as 2.2 → Some water

spilled and I wiped up the water. This takes place only at the later address. Alternatively (with possibly somewhat different conditions) the word at either address together with its following metadiscourse operator are replaced by a pronoun: he, she, it if the word is an elementary argument (and only these, not --in English-- the, if the word is a proper name), these plus self if the operator X over the word is O_{nn} , that and so (with certain other pronouns) if the word is itself an argument. The only positions in which the variant cannot occur are (1) the first address if the operator X has taken a sentence-period as variant (i.e. if the first occurrence of the word is in a preceding sentence), and (2) the first argument (subject) of a tensed first operator under X. (This has some rare exceptions, and examples are given below.) In a very few positions (e.g. in the second argument of O_{nn} , O_{no}) the pronouncing is not optional but (almost) required: John washed himself, A man knows when he is ill (with he, not the man).

Under O_{nn} , O_{nnn} we have the required self, e.g. John saved himself from himself, and optionally (mostly) under a few prepositional O_n : John placed it near him(self).

Under O_{oo} we find the pronouns in all positions, though much more frequently in the second occurrence:

Doctors' bad results with lobotomy led to their avoiding it
altogether.

Doctors' bad results with it led to their avoiding lobotomy
altogether.

Their bad results with lobotomy led the doctors to avoid it
altogether.

Their bad ~~experience~~ results with it led the doctors to avoid
lobotomy altogether.

When the first operator is tensed (IV 2), its subject is not pronounable from later occurrence (condition (2) above):

Doctors avoided lobotomy because of their bad results with it.

~~They~~ They avoided lobotomy because of doctors' bad results with it. (unless the they is a repetition of a word in a preceding sentence). But other first occurrences can still be pronounced from later ones (though uncomfortably):

Doctors avoided it altogether because of their bad results with lobotomy.

John had seen her often before he first met Mary (or: ...before Mary called to him).

When the second argument under O_{OO} is permuted (III 2.5), the pronouncing does not have to be considered as taking place before or after the permutation, but as being independent of it. Permutation alone is seen in, e.g.

Because of doctors' bad results with lobotomy, doctors avoided lobotomy.

Because doctors had bad results with lobotomy, doctors avoided lobotomy.

Pronouncing without permutation is seen in the examples above. The results of pronouncing and permutation, acting independently, is seen in, e.g.

Because of their bad results with lobotomy, doctors avoided it altogether.

Because of doctors' bad results with it, they avoided lobotomy altogether.

Because doctors had bad results with lobotomy, they avoided it altogether.

Because they had bad results with it, doctors avoided lobotomy altogether.

The fact that first occurrences (except for the subject) can be pronounced even without the O_{oo} permutation makes it unnecessary to say that the pronouncing which takes place with the permutation takes place after the permutation: the two are unordered.

Under O_{no} , O_{on} :

That she had remembered John surprised Mary.

That Mary had remembered John surprised her.

That Mary had seen him was known to John.

That Mary had seen John was known to him.

Mary was surprised that she had remembered John.

~~≠~~ She was surprised that Mary had remembered John.

(unless She is pronounced from a preceding sentence).

John believed that Mary had seen him.

~~≠~~ He believed that Mary had seen John.

But: That Mary had seen John was his firm belief.

What surprised Mary was that she remembered John.

What surprised her most was that Mary had remembered John.

(It is especially clear that her is pronounced from the following Mary if the her is unstressed, and if no feminine nouns appear in preceding sentences.)

The fact that variants are selected only as an operator meets its arguments and not thereafter may be seen in the following: In (a) John believes that John is ill only the second occurrence of John is pronounable, because the first is the first subject (condition (2) above). When a further operator enters, we have John's belief that John is ill may be for the best, where again only the second occurrence is pronounable. One might have thought that the change from John to John's makes the first occurrence now available for pronouncing; but the pronoun was determined as between the two occurrences in John believes that John is ill, and the issue is not subject to being reopened

when a further operator enters. The situation is different in John's phoning Mary led to Mary's inviting John → His phoning Mary led to Mary's inviting John because here when the two occurrences of John were brought together by led to, the first was already in the form John's. Now if on (a) the further operator is may be best for John, we obtain John's belief that he is ill may be best for John (or ...for him), but also His belief that he is ill may be best for John: here the first occurrence has indeed been pronounced, but in respect to the newly added for John and not by reopening any prior construction.

There are some limitations on condition (2) above: He was tired, so John decided to stop (←John was tired ...); possibly He must have known it was dangerous or the driver wouldn't have stopped (←The driver must...); She's gone to Boston, has Jane.

Condition (1) above means that while forward pronouncing occurs within a sentence, it does not occur across sentence boundary. We have

- (a) The Indians distrust the government for the Indians know the government only too well
- (b) The Indians distrust it for they know the government only too well.

But if

- (a) The Indians distrust the government. The Indians know the government only too well.

we do not obtain

≠ The Indians distrust it. They know the government too well.

When the metadiscourse operator is same word (i.e. any referent covered by the word) rather than same referent we can have the variant one or it.

This use of one is a pronoun and not a number, as is seen in He took a small pen and I took a large one, He has a small pen and I have a few large ones; Time is valuable, so do not waste it.

I, you are variants which a noun in argument 3 of say (II 3) takes (together with " ", III 2.2) under the metadiscourse operator same as argument 1 (respectively, 2) of say. Thus John said to Frank that John saw Frank (where the arguments of say are (1) John, (2) Frank, (3) John saw Frank), under the operator 3.1 is same referent as 1 and 3.2 is same referent as 2 yields John said to Frank: I saw you.

In addition to the repetitional (referential) pronoun there are the deictic that, it, etc. These are merely nouns (elementary arguments or adjectives meaning "a particular thing") and therefore having a very large selection of operators on them. In most cases they can be made referential by adding to the discourse a mention of the thing in question. Thus for the deictic That man is John we can insert I see (or: speak of) a man. A man is John under the operator argument 1.2 has same referent as argument 2.1: then the second a man can be replaced by that man, or he; given that man we can zero I see a man (III 1.4) and obtain a deictic that.

1.2 Zero for repetition.

The address-bearing operator of 1.1 plus the word at the later address are replaced by zero phonemes, rather than by a pronoun, when the addresses are of certain kinds under certain operators.

1.2.1 Under and, or (and under certain derived conjunctions such as but) if the addresses of the words are the same within the two arguments, the zero variant is available at the second address. Thus from

John saw Mary and John phoned Mary

we have

John saw and phoned Mary

(after permutation III 2.4), but in

John saw Mary and Mary phoned John

we have no zeroing and only pronouncing, to

John saw Mary and she phoned him.

It is necessary that if the two like words (the zeroed one and its antecedent) are themselves operators, their operator-relations to their further arguments be the same, for otherwise the two words do not have the same referent in respect to their arguments. Thus from

He read a letter and he read a lecture

we obtain

He read a letter and a lecture.

But from

He read her a letter and he read her (quite) a lecture,

in which the second has read as an aspectual operator on

He lectured her (quite),

we do not obtain

~~∇~~ He read her a letter and quite a lecture.

Similarly from

He took an umbrella and he took a walk

we do not obtain

~~∇~~ He took an umbrella and a walk

since the two occurrences of took are words of different operator sets, one an O_0 aspectual operator on He walked and the other an O_{nn} elementary operator on the pair he, umbrella.

The conditions above permit

He planned to go there and she didn't want to.

to be reachable by zeroing from both

He planned to go there and she didn't want to plan to go there.

and: He planned to go there and she didn't want to go there.

since the zeroed words have the same operator relation to the residual words (including tense) of the second argument as their antecedents have to the parallel (residual) ones of the first argument.

In keeping with these conditions, zeroing occurs between passive and active:

The box was caught by them but the box slipped

The box was caught by them but slipped,

where box is first argument of is...en (the passive operator) and of slip.

But zeroing does not occur if a second argument is merely permuted to first place:

This say we all but this is untrue.

does not zero to

~~∇~~ This say we all but is untrue.

If the operator X (1.1) on which the metadiscourse operator acts has taken sentence-period as variant (IV 1) the only address at which zeroing can regularly occur is the second operator with its second argument but without the tense on it. That is to say that (in general) across sentence boundary only verb with its object is zeroable: I wrote a letter. He will later (← He will write a letter later).

1.2.2 Under the comparative conjunction, complex zeroings occur. It will be seen in ^{IV}5.1 that the comparative construction can be obtained from wh on the elementary operator is more than, is less than. Thus

People read more books than (they were) expected (to read).

People read more books than had been bought

can be derived from

People read books which were more than the books which people were expected to read.

People read books which were more than the books which had been bought.

There are certain zeroings which can occur, by the conditions given below in

1.2.3 for wh, e.g. in non-comparative wh sentence similar to the above:

People read books which were near the books which people were
 expected to read

People read books which were near the books which had been bought

(Here we might expect zeroings to:

People read books near those they were expected to

People read books near what had been bought.)

It is clear that the wh forms with more than can have some zeroings additional to those with near, etc. Furthermore, many comparative sentences, after they have been obtained from wh ones with more than, take zeroings which are quite different from those under wh, but are rather like the zeroings under and (though not entirely identical to these). Thus

Men read more books than women (do).

can be obtained from

Men read books which are more than the books which women read,
 but if the latter were not comparative, e.g. if it was

Men read books which are near the books which women read,
 we would not be able to zero the second read as we can in the comparative.

The derivation of the comparative from wh, and its zeroings, will be discussed in ^{IV}5.1. The differences in zeroing are not large, and can be considered to be due to the exceptional likelihood of symmetry in two compared sentences. In the present section, we are considering repetitional zeroing which is due to the fact that the metadiscourse operator stating that a given word-occurrence is a repetition of another reduces to zero the information contributed by the given word-occurrence. In III 1.4, we will see that certain words are zeroable under a given operator if they are the appropriate (i.e. favored) words to occur in the given position under the given operator. In the discussion of the comparative in ^{IV}5.1, we will see that under the comparative operator what is appropriate is the fact of repetition: That is, what is

avored is the situation of having various parts of the two sentences be identical while their residues are being contrasted. Hence the repeated portions are zeroed beyond what they would be if the two sentences were under some other operator than the comparative.

1.2.3 As to O_{oo} (other than and, or, wh), most of these permit zeroing under them of the second operator and its second argument, or else of its first argument alone:

John's leaving early was due to Mary's.

He made mistakes while waiting for a call.

His making mistakes was while waiting for a call.

(In the case of while, when with untensed second operator, zeroing its first argument is required.) Under the conjunctive form (3.3, e.g. because, if), the second sentence (and under wh either one) can zero a repeated operator with second argument (leaving the tense), or (under certain conjunctions) a first argument plus the operator is:

I will go because she will. (Rarely: I will, because she will go.)

I will go if invited.

People who can't smoke shouldn't. People who can't shouldn't smoke.

1.2.4 Under O_{no} , for certain such operators there is a high likelihood that the first argument of the O_{no} is the same as the first argument of the subsidiary operator, e.g. like: John likes for him(self) to be first, John likes his finishing the job, though there also exists John likes for her to come on time, John likes their bringing presents. In such O_{no} , if the subsidiary subject is indeed the same as the main one (by the metadiscourse operator), it is zeroed: John likes to be first, John likes finishing the job. For other such operators, the high likelihood is that the second argument of the subsidiary operator should be the same as the first argument of the O_{no} , e.g. undergo (and less strongly so, suffer): John underwent their investigation of him (or: their investigating him), John suffered their defeating him

(or: defeat of him at their hands), but also The peasants suffered the invaders' repeated attacks against them. In such cases, when the object is indeed the same as the main subject, it is zeroed. (In the above examples, the subject of the subsidiary operator is also zeroed, but as in indefinite, III 1.3.) Thus:

John underwent the investigation (or: their investigation)

John suffered defeat (at their hands)

The peasants suffered repeated attacks.

Similarly, there are O_{nno} for which the likelihood is that the subject of the subsidiary operator be the same as the second argument of the O_{nno} , as in urge: John urged Frank that Frank go, which is then zeroed to John urged Frank to go, although there is also the less likely John urged Frank that Mary go. And there are O_{nno} for which the likelihood is that the subject of the subsidiary operator be the same as the second argument of the O_{nno} , as in order, command: John ordered Frank that Frank go John ordered Frank to go, though there is also a much less likely John ordered Frank that the children come on time thereafter. There are various O_{nno} with more complicated likelihoods and zeroings, e.g. offer: John offered Frank that John would go → John offered Frank to go, although there is also John offered Frank for Frank to sit on the stage which is perhaps zeroable to John offered Frank to sit on the stage.

In many O_{no} and O_{nno} , if the subsidiary operator has the form to V its first argument is zeroed by repetition, but if it has the form Ving, its first argument is zeroed as indefinite (III 1.3):

I prefer to swim, I showed him (how) to play chess.

I prefer swimming, I showed him chess-playing.

In operators where the subsidiary subject must be the same as the first or second argument of the O_{nno} the best analysis is to consider the O_{nno} as having one argument less, i.e. as being O_{no} or O_{on} . Thus John promised Frank

to go should perhaps be analyzed as John's going was a promise to Frank, and the set which includes John expected Frank to fall, John prevented Frank from falling should be analyzed as O_{no} : John expected Frank's falling, John prevented Frank's falling. However some of these restrictions apply only to the reduced form, and should therefore be considered reductions on an O_{nno} . Thus for promise we have John promised Frank that the day would be nice, etc. The reduction of that...would... to for...to... with zeroed first part) happens only to most likely case after promise: where the subject of the argument-verb is the same as the subject of promise.

1.3 Zero for constants.

There are certain words which, in all occurrences or in particular kinds of environment, impose no selection ~~on~~ their arguments or operators. In these situations, these words function as constants, introducing no information into the discourse at that point; and in many sentence-positions they can take zero as variant.

1.3.1 One example is the indefinite noun (or "pronoun") a thing, something, things, someone, anyone, and the like, which is zeroable as second argument of very many operators: He reads ← He reads things or the like, He is going to eat He is going to eat something, but not after wear: ~~≠~~ He wears. As first argument, the indefinite is not zeroable unless it has the operand-indicator of being under a further operator, O_{no} , O_{oo} , etc., e.g. I watched chess-playing ← I watched people's chess playing, Swimming there is dangerous ← Anyone's swimming there is dangerous, To win it is to become rich ← For one to win it is for one to become rich.

Together with the zeroing of which is (III 1.3.2) we have here the source of many peculiar forms. Thus it is clear that in I never eat her cooking we have a zeroing from I never eat anything which is her cooking.

The zero variant can also be taken by words which have no selection in respect to a set of operators, when they are under operators of the set. Thus words such as set, group have high likelihood as first arguments of certain operators (e.g. gather). Under most other operators they are not independent when they intervene between these operators and consist of, include, or the like: If we have A group which included John and which included Frank and which included Mary gathered at the corner (from wh on A group gathered at the corner, A group included John, etc.), we obtain A group which included John and Frank and Mary gathered at the corner. Here group is zeroable as an indefinite and including (or which included) is zeroable as appropriate to it (III 1.4), yielding John and Frank and Mary gathered at the corner.

In this way we can also see how to decompose such a sentence as Heart disease and cancer struck down X people in 1974. All interpretations of this sentence (whether union or intersect of these diseases) are given by: A set of diseases which consisted of heart disease and cancer struck down X people in 1974 with zeroing of a set of diseases which consisted of which contributes no selection in this sentence.

1.3.2 After the second argument of wh (II 7) has been moved to after its addressee (III 2.4), the which is can be zeroed whereupon the residue, if an adjective, (defined in IV 3.1) moves further, to before the addressee (III 2.5): The book which is expensive has arrived → The expensive book has arrived. Although this which is is a constant here and its presence is recognizable even after it has been zeroed, the zeroing does not occur without an additional likelihood consideration: the residue A of this zeroing has to have high likelihood of being a property (hence a subset) of the antecedent addressee, where the antecedent necessarily includes all "modifiers" which have already joined the addressee before the entry of A.

In this way the adjectival words before a noun get to be arranged so that increasing closeness to the noun expresses increasing permanence as properties of that noun: a cracked blue glass pitcher ← a pitcher which is of glass,
a glass pitcher which is blue, a blue glass pitcher which is cracked. Non-
 adjectives do not in general move leftward: the man here ← the man who is here.
 If the post-which is word is a noun, it is called appositional: my friend the
ambassador ← my friend who is the ambassador. (In compound nouns, III 1.4.2,
 the post-which is words are prepositions, etc., which are zeroed.)

The likelihood requirement on zeroing which is explains the apparently semantic sequences of time-words. We have at 3 P.M. Tuesday, March 4, 1973,
 and similar sequences, but not e.g. β at 3P.M. at 4 P.M. on Tuesday Wednesday.
 However if we consider the forms without zeroing of which is we find that
 there exist such sequences as at 3 P.M. which is at 4 P.M. on Tuesday which is
Wednesday (e.g. if one is crossing the international date-line and is also
 involved in daylight-saving). The only difference is that here the which is
 are not zeroed, for the reason given above. Thus the other sequences of
 time-words exist in sentences, but which is is zeroed only for the more likely
 sequences.

1.3.3 There is one operator (with its first arguments) which occurs at
 the start of every discourse, and at many internal points, and which is zero-
 able as being a constant: ubiquitous and selectionless. This is I say
 (or: report) (to you), or N says (or: reports) (to M) where N and M are the
 names of speaker and hearer. The importance of assuming the existence of this
 will be seen in IV 2. There are many indications that at almost any point in
 a sentence there may occur word-sequences which can only have arisen there due
 to a (zeroed) I say to you operating on the sentence. To give only one
 example: We can say The New York Times said that that stupid A--B-- is not
going to resign. Now of course the Times did not say that A--B-- was stupid.

What makes it possible to say the above sentence is that it is zeroed from The New York Times says that A--B-- who I say is stupid is not going to resign. The I say can be freely zeroed, and then who is is zeroed by 1.3.2, and the result is the given sentence.

1.3.4 A final zeroing of selectionless segments is the case of individual operators composed of more than one morphemic portion: one portion can be zeroed leaving the residual portion to constitute the presence of the operator. Thus it will be seen (III 2.1) that for the time-order operator before we affix an -ed to its first argument, so that (I report) John's walking before the nurse's return becomes John walked before the nurse's return (IV 2); when the nurse's return is zeroable as repetition, we are left with He walked before. In this situation, where -ed before are two parts of a single operator, the second portion can be zeroed, leaving He walked. Of course, before was the original operator, and the steps sketched above led to its replacement by -ed. But this will be understood more fully in IV 2.

1.4 Zero for appropriate words.

In certain operand-argument combinations a very important situation arises: one of the participants has a unique status in respect to the other, in most cases as being by far the most likely one there. We will say that it is the appropriate word in respect to the given operator or argument. In this situation, the appropriate word brings little informational contribution to the resulting sentence, and it can take zero as a variant.

1.4.1 A simple example is that of expect. The second argument of expect is generally an operator (equivalently, a sentence): John expects their departure at 6. However there are also certain elementary arguments which appear here: John expects Frank. It may then be noted that every one of these which occurs here can also be the first argument of is here: ~~∃~~ Frank is here, ~~∃~~ John expects time, ~~∃~~ Time is here. Indeed, if we supply be here,

come, or the like after every noun-object of expect, we obtain John expects Frank to be here, etc.; and the inequalities of these sentences (including ~~3~~ John expects time to be here) as compared with those with noun-object (John expects Frank, ~~3~~ John expects time) shows that the latter are transforms of the former, obtained by zeroing on to be here. We then no longer need to say that expects is both O_{no} and O_{nn} , for the apparent O_{nn} occurrences are zeroed from O_{no} .

A similar situation arises in He reads Shakespeare from He reads the writings of Shakespeare or He reads things which Shakespeare wrote (where things which is zeroing of the indefinite as in 1.3.1, and wrote is a zeroing of the "appropriate" second argument of read). It is this zeroing which explains He read some (of) Shakespeare, He read a lot of Shakespeare.

The effect of appropriate zeroing in this situation is in general to change the object-requirement of an operator (e.g. from O_{no} to an apparent O_{nn}).

1.4.2 If we consider compound nouns we find that they can almost all be derived in a single way from a main noun followed by zeroable which is (1.3.2) followed by an appropriate preposition or verbal adjective (in effect is specially for) followed by a noun (whose form may be Ving); when the which is and appropriate word are zeroed, the following noun is permuted to before the main noun (III 2.5) with compound-stress on the two. Thus school-books ← books which are for school, lecture notes ← notes which are for a lecture, color-slide ← slide which is for color, milkman ← man who is special for milk (or the like), life-jacket ← jacket which is specially for (preserving) life. The appropriate words, which are zeroed, cannot always be reconstructed with certainty (if the full, non-compound, form is rare) but they generally mean specially for, belonging to, or the like.

In the same which is construction somewhat different appropriate prepositions or verbal adjectives are zeroed with the residual noun moving leftward

to become not a compound-stressed but an adjective-stressed noun, with corresponding difference in its meaning. Thus, a metal chair ← a chair which is (made) of metal, a wood fire ← a fire which is made of (or: with) wood, a Ming vase ← a vase which is of the type (or: class) Ming.

The appropriate prepositions (for, of, etc. above) may themselves be reduced forms of appropriate verbs or adjectives which are more particular for various sets of noun pairs (e.g. made of; and for the compounds: intended for, belonging to). The effect of this appropriate zeroing is to place nouns to the left of (i.e. before) another noun, as modifiers of that noun, but nearer to it than its adjectives (which express its relatively less permanent properties, III 1.3.2).

1.4.3 We consider some different situation in which an operator has zeroable appropriate arguments. In the quantity operators is more than, is less than, is as much (or: many) as, increase, etc., whose most likely first and second arguments are the numbers and amount, degree, etc., the indefinite arguments (e.g. amount) are zeroable when there is an argument below them in turn. This is somewhat tentative for single occurrences, e.g. under increase: The students have increased ← The number of students has increased. Assuming the zeroing of number, amount in such a sentence depends upon the question of whether student is indeed an argument of increase. The matter can be seen more sharply in, e.g.. (a) A handful of coins were (or: was) on the table, which could be most regularly described as zeroed from (b) wh operating on Coins were on the table in an amount, The amount was a handful (from something like *The amount was the full of a hand). This would yield some such form as A hand-filling amount of coins were on the table, to (a) above (III 2.3). The importance of some such route lies in the principle of going through the precise grammatical status of each morpheme in the sentence. In (a) above, the coins did not fill the hand, so that handful would have to

be taken, ad hoc, figuratively (whereas in I am holding a handful of coins it is literal). But in *a hand-ful amount of coins, which by III 2.3 would be reduced from a hand-filling amount of coins, the word handful is derived from the occurrence of its component morphemes in this very sentence, as is seen in (b).

The zeroing of indefinite amount, degree is more clearly established for paired occurrences under is more than, etc. (1.2.2): They walk more than they ride They walk in an amount which is more than the amount to which they ride, with in an amount, the amount (to) zeroed as appropriate, and which (is) zeroed by 1.3.2. (There is also They walk more (or: rather) than (they) ride comparing to the likelihood of the actions and not to their amounts; this is obtained directly, without zeroed amount.)

Rather similar are the linear-order operators is before, is after, is as whose most likely arguments are moment, period, and other time-segment words, and point, level and other space words, and many nouns (The tree is before the house, Napoleon was before Lenin). The time-words are zeroable under before, etc.; there is an operator under them in turn: He worked before she arrived His working lasted throughout a period which was before the moment at which she arrived. The presence of period, moment, even though in zeroed form, is seen in the preference of before for being followed by "momentaneous" or "perfective" operators which select moment and not period; similarly until prefers period as first argument and moment as second. Thus ~~3~~ He worked before she was working (← His working lasted throughout a period which was before the period throughout which she was working), ~~3~~ He worked until she arrived ← His working was throughout a period which lasted until the moment at which she arrived, ~~7~~ He arrived until she was working which would be from the very bizarre His arrival was at a moment (which lasted) until the period throughout which she was working. One could say that before's preference for momentaneous verbs to follow it, or until's preference for "durative" or "imperfective" verbs

as first argument and momentaneous verbs as second argument, is simply the selection of these conjunctions as operators on verbs. But before, until also have moment, period as arguments; and all momentaneous verbs also can have at a moment on them and durative verbs can have throughout a period as operators on them; and the verb selection of before, until can be obtained precisely from the moment, period selection of the verbs. Hence by saying that the short forms above are obtained by appropriate-zeroing of moment, period, we simplify the selectional data, and the classification of before, until (which then do not have to be O_{00} in addition to being O_{nn}); and we get a characterization of the aspectual properties of the sentence in terms of the operators actually present in it (even if in zero form) rather than in terms of a grammatical discussion made outside the sentence.

What is more important is that if we assigned verbs to two classes, momentaneous and durative, then for the time-conjunction we would have a grammatical rule (e.g. until takes durative first argument and momentaneous second), whereas for the moment and period operators we would have only a strong selection: His arrival was at a certain moment, His arrival took place at 3:52 are in the normal selection for arrive, but His arrival lasted throughout a certain period, His arrival lasted from 3:50 to 4 o'clock are not impossible sentences; similarly His working lasted throughout a certain period is in the normal selection for work, but His working occurred at 3:52 sharp and that was it for the day cannot be excluded by grammar. Hence the situation that we see is of momentaneous and durative operators which have a selectional relation to verbs. Furthermore, the occurrence of moment or period as arguments of the time-conjunctions is also not so much a matter of grammatical rule as of likelihood of combination: His arrival was at a moment which lasted until the period throughout which she was working is not so much ungrammatical as nonsensical, and for special meanings (an important moment which seemed to

last long?) might happen to be said. In contrast, He arrived until she was working is more fittingly describable as ungrammatical than as nonsensical or rare. What is ungrammatical here is the zeroing. Zeroing occurs in this position for the high-likelihood operator between verb and time-conjunction: His working was throughout a period which lasted until...→ He worked until...; but in His arrival was throughout a period which lasted until... and in His arrival was at a moment which lasted until..., to the extent that these might happen to be said, there is no zeroing. This is a situation which applies to a great many variants: Particular operators have a high likelihood on certain arguments while other operators have a very small likelihood on them, but nevertheless can be said, even if only nonsensically or in special circumstances. The reduced form of these operators, however, applies only to those of high likelihood and not at all to the others, so that the occurrences of the reduced form for the less likely cases is not merely rare but is excluded. It is thus that the reduced form is limited by a grammatical "rule", whereas the full form is subject only to likelihood and unlikelihood, i.e. to selection.

1.4.4 In some cases an operator on two arguments is by far the most likely for certain sets of its arguments. When it and these arguments are under wh such an operator may then be zeroed. Thus the operator to last on a sentence and a time-segment word is the appropriate one for that pair: His speaking lasted two hours (though one might also think of His speaking exceeded two hours), His speaking is delayed two hours. Under wh we have His speaking which lasted two hours was before→He spoke lasting two hours (IV 2); here we find a reduced form He spoke for two hours and a zeroed form He spoke two hours.

1.4.5 A clear example of appropriate zeroing is when a classificatory operator is fully determined by the occurrence of the argument under it and the operator on it, which would not occur together except via this classifier. E.g. in The word like has four letters (from wh operating on A word has four

letters, The word is like), the shortened form Like has four letters leaves it quite clear that the word is present, as operator and argument of like, has four letters, even though its shape is zero. (In Mary has four letters we have both this analysis, and also an elementary sentence concerning four letters to mail, or four letters of the alphabet, being in Mary's possession.)

1.4.6 In 1.3. it was seen that an operator could be zeroed if a portion of it had been affixed to its argument, as in He talked before He talked. In 2.1, 2 it will be seen that just as -ed can be attached to the arguments of before, so interrogative and imperative and assertion intonations are attached to the whether, that arguments of ask, request, say respectively. However in the intonational case each of the determining operator is not unique because it can have various first and second arguments, and tense, before the whether and that: N₁ asks N₂ whether..., N₁ asked N₂ whether.... Hence the determining operators are not zeroed as is before, in 1.3.3. However, for each one of the three there is a distinguished case, when the first two arguments are respectively the speaker and the hearer (I and you) and the tense is present. This has not only special likelihood, but also the unique property of being performative: When the speaker says to the hearer I ask you: Is he coming? the question Is he coming? has **thereby** been posed; it cannot be false that the speaker is asking this. But if he says I asked you: Is he coming? or John asks Mary: Is he coming? the question is not thereby posed and the statement that it is posed may be false. The three segments I ask you, I request you, I say to you are zeroable, as unique performatively-appropriate portions of the three intonations which they had imposed on their respective third arguments. Similarly, I report that is appropriately zeroed before the tensed sentence that is its argument: I report that he went. He went.

1.4.7 Sentences which are connected by wh to a sentence S_1 and which explain the material in S_1 can be appropriately-zeroed if the explanations are self-evident to the hearer of S_1 ; reintroducing them makes S_1 derivable from a more self-contained sentence.

In particular, deictic pronouns can be thus derived from repetitive ones: e.g. That nail won't hold ← That (or: the) nail of which I am speaking (or: which we are dealing with) won't hold, formed from wh on A nail won't hold, I am speaking of a nail (or: We are dealing with a nail).

This applies also to metalinguistic grammatical and dictionary sentences which give the operator relations and the definitions of the words in S_1 . That these sentences can be presumed to have been conjoined to S_1 and then zeroed because known, follows from the fact that if some unknown phoneme sequence is presented to a hearer he knows it as a sentence of the language only if we conjoin to the sentence statements assigning its successive phonemes to operator and argument sets which can have members in those positions.

2. One-one variants.

In III 1, the pronominal and zero shapes of each variant could be taken by many operators or arguments, although in a given sentence it is a particular word or word sequence that receives the variant. Ambiguities can result: In the case of pronouns this happens in many situations, since one address is lost in taking the variant (III 2.4); in the case of zeroing this happens only if a different operator-argument sequence may chance to make the same word sequence as results from the given zeroing. In III 2, we see situations in which particular operators or arguments take variants unique to them, with no ambiguity unless by chance some other word or variant has the same phonemic content as does the given variant.

2.1-3 Attachment.

One of the most important types of variant in many languages, especially those called inflectional, is attachment. In this, an operator that has extremely wide normal selection has a variant of itself attached to its argument. The variant may be an affix (2.1) or an intonation (2.2) which is added to the phonemic content of the operator (e.g. tense, or the intonations), after which the original operator may be zeroed (III 1.3.3, 1.4.7) leaving the attached portion to take its place. Or the variant may be an affix (2.3) variant of the operator, so that the affix and the original operator never both occur together. The great bulk of affixes in a language, as well as the intonations, can in this manner be considered as variants of free-word operators.

2.1 Attachment: of inflectional affixes (under wh)

The three linear-order operators after, before, as have an exceptional normal selection in that they have a high likelihood of occurrence on an operator, via the intermediate time-duration words moment, period, etc. (III 1.4.3). Under wh, each of these can receive a variant consisting respectively of will prefixed or -ed, -s suffixed onto their argument, in addition to their own phonemic content: John doubts Mary's telephoning, which (i.e. Mary's telephoning) is before the mail's arrival → John doubts that Mary telephoned before the mail's arrival. With the use of this affix the argument indicator is changed from the affixal form ... 's ... ing, etc., to that (or whether). Details of this variant, and the further variants which produce the tense forms, are given in IV 2.

Although after, before, as with moment, period, etc. have good likelihood of occurring on every operator, their likelihood is less on the most durative operators--the ones that become adjectives, prepositions, nouns rather than verbs (see ^{IV} 3.1) and on these the affixal variants are not attached directly to the operator but to a carrier be before the operator: He will talk, He talked;

but He will be large, He was large. Note that if we consider the affixes to be variants not of a time-order binary (i.e. two-argument) operator before, etc., but of a time-location unary (one-argument) operator in the past, etc., we would not have an explanation for the difference between the verbs and the other operators, since all can be more or less equally in the past or in the future, but the most durative ones are less likely to be talked of as being before or after some other event.

2.2 Attachment of intonation.

There are certain O_{nno} , O_{no} operators (III 1.4.6) which have normal likelihood on almost every operator, i.e. sentence (as second or third argument), and which have a variant consisting of imposing an intonation on the tensed form of their argument, dropping the that, whether argument-indicator. The most widespread is N_1 reports (to N_2), N_1 says (to N_2), N_1 thinks and the like which can be assumed to stand at the head of every discourse and which impose period-intonation on their third argument: I say that John will arrive I say: John will arrive. The I say is then zeroable (III 1.4). I say may also be present at various points inside this third argument of the lead I say, and these may or may not be zero. There are many indications of the zeroed I say, e.g. He is wrong, and I am prepared to say it again ← I say he is wrong, and I am prepared to say it again. Note that it is doubtful whether we can say He is wrong and I am prepared to say it without some contrastive element in the and I...say to contrast with the zeroed initial I say or I think (e.g. contrastive-stressed prepared as against just saying, or contrastive-stressed say as against think, or to say it openly as against the implicit privately of the first I say).

Somewhat less likely on certain sentential arguments are N_1 asks N_2 whether S and N_1 requests (commands, etc.) that S. Under command, etc. the S has the "subjunctive" zero tense because the time of S is always later than

the time of command (IV 2), and although the first argument (subject) in S can be any noun, the intonation (usually with zeroing of the subject) occurs only for the most frequent subject of S_1 namely you: I command that he go; I commanded that you go → I commanded: You go!. I command: Go! Evidence that the intonation comes under request, command, etc. is that please occurs other than as verb only under request, etc. and under the imperative intonation: I request that you please go, Please go! (← I request: Please go!) Evidence that the zeroed subject under the intonation is you is seen in the self-pronoun: Wash yourself! (← You wash yourself!, I order that you wash yourself.

As to ask whether, we have seen that this is obtained from ask operating on or (II 5.2). We have I ask whether he left → I ask: Did he leave? with the tense and auxiliaries (can, etc.) permuting to before the subject, the suffixed tenses carrying a preceding is, has verb with them and otherwise getting a carrier do. The or may repeat, and we then have I ask whether S_1 or S_2 or S_3 , etc. → I ask: S_1 or S_2 or S_3 ? to which the answer is one or more of the S_i or their denial: I ask: Are you leaving or is he staying? The or may be on S_1 , not S_1 , in which case S_1 or not S_1 is appropriately zeroable, and the answer is Yes, S_1 or No, not S_1 : I ask Are you staying or not?, I ask: Are you staying? If the sentences under or are identical except for the words in one position (or in more), the words in one position are collected with intervening or (by zeroing^{III} 1.2.1 and permutation^{III} 2.4), whether plus the resultant being pronounced in a wh-word: I ask whether John left or Mary left → I ask whether John or Mary left → I ask who left → I ask: Who left? (The answer is one of the pronounced words.) In this way both the yes-no and the "wh" question are obtained by the same variants.

There are certain O_{no} which can have whether (as well as that) marking their sentential argument, but which do not impose the intonational variant: I know whether he left (or not), I know who left, but ~~I~~ I know: did he

leave?, ~~≠~~ I know: Who left? Unlike the O_{nno} or O_{no} which impose this intonation, there are O_{no} which do not characteristically impose whether (but rather impose that). When whether follows them, it is due to an intermediate appropriately-zeroed operator such as choice, alternative (which do impose whether and do have the intonational variant): I know the choice as to who left.

There is one other important intonation introduced as a variant for a few extremely widespread operators: chiefly and, for. When a discourse contains one of these O_{oo} , necessarily between two sentential arguments, (i.e. each an operator with its arguments and without any operand-indicator, II 5.1), period intonation can be imposed on the first argument. The segment up to the and, for, then becomes what is called a sentence. Most further operators, e.g. the sameness operators on the and (II 6), do not affect the argument closed by period: for example, the permuting of the sameness operator (III 2.4) does not then cross into the first argument. The sentence is thus relatively unaffected by what comes later. And since and, and to a lesser extent for, have least selectional limitations on their arguments, and have no operand-indicators to undo--i.e. no non-associativity to worry about, the result is that segmenting a discourse into sentences in this way produces a succession of least inter-related or interrestricted segments of the discourse. This is precisely what the sentences of a discourse are.

After the period intonation, the and, for can take zero variant, by 1.3.3
 Thus: I was too tired to stay and I decided to leave→I was too tired to stay.
And I decided to leave.→I was too tired to stay. I decided to leave. And also:
I decided to leave for I was too tired to stay.→I decided to leave. For I was
too tired to stay.→I decided to leave. I was too tired to stay.

2.3 Attachment of operators: affixes.

The great bulk of English affixes (except for those which occur on very few words) can be described as variants of "source" operators which have wide selection, the variants being short and unstressed (and in many cases suppletive--i.e. phonemically entirely different from the "source" operator word) and attached directly to the argument of the "source" operator--this argument being in most situations itself an operator. The variant is a suffix if the "source" operator was after the argument (either originally, or due to a compound-permutation, III 2.5); and the variant is a prefix if the "source" operator was before the argument (either originally or due to a permutation). Thus

- (1) His being a child is a condition.
- (2) The condition of his being a child was happy.
- (3) His child-condition was happy.
- (4) His childhood was happy.

In (2) we have (1) receiving an operand-indicator under the further operator happy; as in all indicators, the former operator is treated as a noun and its arguments in turn receive ... 's, of, by (as in The quickness of John from John is quick). In (3) we have the compound permutation of III 2.5, in which condition is permuted with its following P N (of...child) with the P and the being (the latter being merely the carrier of the operand-indicator -ing) zeroed (III 1.4). In (4) the second noun of the compound, already reduced to secondary stress, is reduced to unstressed and is phonemically replaced by hood.

Lest this derivation seem fanciful, it should perhaps be noted that it is consonant with that indicated in the Oxford English Dictionary. There was a Germanic noun, from which the Dictionary gives, for example, "Old English cild-had child-condition" and which, the Dictionary comments, "ceased at length to be used as a separate word and survived as a mere suffix, and is thus noteworthy as a late example of the process by which suffixes arose". To this one

need only add that a few words such as condition which approximate the selection of this O E hád have not ceased to be used as separate words, and that today's -hood has approximately the relation to them that the compound -hád had to the free word hád before.

As an example of a prefix at its simplest, consider

(1) He is against war.

(2) He is anti-war.

where against is attached to war, with replacement of its phonemes. The resultant word is now subject to leftward permutation (III 2.5), i.e. is what is called an adjective, whereas the original against war is not: He is in the movement which is anti-war → He is in the anti-war movement; but He is in the movement which is against war does not permute (~~is~~ ... the against war movement).

The operators which have such wide selection as to give them very general meanings and high likelihoods are ones like is an event, is a condition, constitutes an occasion, is of such-and such duration (momentary, bounded, relatively permanent, etc.--these are the classificatory aspect-operators), yields a product, is not, etc.; somewhat more special in meaning, but still of very wide selection, are is at a place, is female, is for, is before, one, two, three, etc. All of these have affixal variants, but many of them have different variants when attached to different words, so that what is wide-spread is not the particular affix but its "source" operator.

Affixation is simply a variant which reduces the stress of an operator and eliminates the word-juncture (phonemic features of pause) between it and its argument; but in addition, most affixes have entirely different phonemes than the operators whose reductions they are.

The decision as to whether the variant is a suffix or prefix depends on whether the operator is after or before the argument when the unstressing takes

place. The only variants which move an operator to before its argument, are the following:

(a) When the operator to be affixed is what we may call a sentence-classifying N_s (event, process, condition, quality, etc.), and is then under a further operator, then the N_s with its argument can take an operand-indicator which puts it before its argument: e.g. His being a child is a condition above. This applies to 1.2-3 in the affix table of IV 4.

(b) When the operator to be affixed is an "aspectual" (e.g. have a property, tend to, become, approximate, be potential, be not, be contrary) it can permute to before its immediate argument (III 2.6), as in His coercing is a disposition, He is disposed (or: prone) to coercing. (Thence, by compound: *He is coercing-prone; and by unstressing and phoneme-changing: He is coercive.) This applies to 1.5,6 and 2.3-5 in the affix table.

(c) When the operator to be affixed and its argument are under wh, the zeroing of wh puts the operator immediately before its argument. One form of this is, e.g. This is a tax which is (in) excess, This is an excess tax; whence by unstressing and phoneme-change This is a surtax. This applies, in different ways, to 1.7 and 2.6 in the affix table.

The great bulk of affixes come from wide-selection operators which were before their arguments either originally (1.8,; 2.1,2 or due to the three permutations listed above. (Perhaps the adverbial -ly, and the -ess type of suffix, 1.9, were not before their argument.) On most of these operators, the compound permutation (III 2.5) placed the operator after its argument and reduced its stress. Unstressing and phoneme-changing on these yields the suffixes. On the others, there was no compound permutation; unstressing and phoneme-changing on these yields the prefixes. The only important affix sets outside of this analysis are the tense (III 2.1), plural, and the operand-indicators (II 1.2; 4).

In IV 2, a table is given of the types of prefix and suffix variants of operators. Meanwhile, a few comments may be in order as to the reasons for such an analysis. That some operator is contained in certain of the "nominalizations" of sentences (or of verbs, etc.) is clear from the fact that the further operators upon these nominalizations differ. Thus we have That John erred is a fact, ...is clear and John's having erred is a fact, ...is clear but hardly *John's error is a fact, ...is clear. Also That the bank closed is a fact, but hardly *The bank's closure is a fact. In contrast, ~~∇~~ That John erred was frequent, ~~∇~~ John's having erred was frequent, but ~~∇~~ John's erring was frequent, ~~∇~~ John's errors were frequent, but hardly *The banks' closures were frequent. Then we have The bank's closure (but better: closing) constituted a sad occasion, but ~~∇~~ That the bank closed constituted a sad occasion. And John's childhood was happy, but ~~∇~~ John's having been a child was happy. John's error consisted in missing a minus sign, but not *That John erred consisted... We have His receipt of the letter was a great moment, but His reception of their ideas was cordial.

From all this we see that different suffixes come under different further operators (is a fact, is frequent, constitute a sad occasion, is happy, is cordial). However, the correlations are very complex, and are made much more simple if we posit a set of intermediate operators, which we can actually find as paraphrastic transforms added to these suffixes, which on the one hand have a regular selection to these further operators, and on the other hand impose a particular suffix on particular arguments under them (often, different suffixes on different arguments, but in a listable way). These intervening operators are a few words such as event, process, condition, quality which have a wide selection--operating normally on many but not all operators--and are thus ready candidates for receiving reduced variants, i.e. the affixes. The further operators act on the intervening operators (which have become affixes)

and have their selection to these intervening operators. Thus in John's early childhood was happy we have wh on John's being a child was a state, The state was early, and all this under wh to The state was happy yielding The early state of John's being a child was happy, John's early childhood was happy.

Here more than elsewhere it is clear that we can not think of the variants as being derivations. Many indeed are derived from free words, but even in these cases the free words may now be unused, so that the affix is now a variant not of its same word as free operator but of whatever words are now being used in place of the free occurrences of the original word: e.g. -hood is now a variant of state, condition or the like rather than of the no-longer-used free occurrences of the earlier form of hood. This nonderivational situation is buttressed by several factors: On the one hand there is much historical evidence of analogic extension (including nonceforms) of a suffix to arguments on which the free word operator had not acted (e.g. in the Oxford English Dictionary, under many of the suffixes). On the other hand there are cases of a suffix, which was indeed a suffixed form of a free word operator, changing its meaning over certain arguments in such a way that the original subjects and objects of that argument no longer occur under that suffix, so that the suffix can no longer be considered a transform of the operator from which it was derived. Finally, it will be seen later that the whole relation of derivation is not essential to the present theory, since the variants are taken at fixed points in the formation of a sentence (namely, at the moment when the operator and argument which alone are involved meet, and when the physical--i.e. phonemic--conditions for the variant, if such are stated, are met): that is to say, the variants have no freedom of ordering such as could be expressed by an ordering of derivation.

Despite the occasional use of a derivational mark above, the free word operator is only a variant of the suffix, i.e. it is a phonemically different

form which has the same operator-argument status as does the affix, and which has approximately the same selection (over the domain on which the affix is used).

It is important to note that the occurrence of the affixes on words is determined not merely by the word but also by the position of the word as operator or argument in a sentence. Thus it is not child that receives -hood but only being a child (i.e. child as operator, or alternatively as object of is-member-of-set): there is no ~~7~~ The childhood fell down from The child fell down, and the only occurrences of childhood are in operator occurrences of child. Affixation is thus made in syntactic conditions, and the syntactic relation of an affix to its argument can always be expressed by the relation of some operator on that argument, the operator (not necessarily a single word) being so chosen as to have approximately the same inequalities of likelihood in respect to its set of arguments as the affix has in respect to the set of words to which it is attached. Examples of this will be seen in IV 2. This possibility of a free-word paraphrase satisfying the criteria for being a transformation exists even for heavily "inflectional" language, e.g. Latin, in which no free-word derivation of **many** of the affixes is available.

2.4-8 Permutation. There are certain conditions in which particular kinds of operators can move in respect to (chiefly, permute with) their arguments. For English, these are as follows:

2.4 Moving to addressee. There are two permutations which bring operators that include (refer to) addresses outside them over to the address to which they refer.

2.4.1 The sameness operator. In II 6,7 it was seen that we must assume, in sentences containing pronoun (including wh-) and repetitional zero, the availability of a variant such as with address a in argument 1 having same word (or: referent) as address b in argument 2. The occurrence of the pronoun and zero are most easily stated if we assume a permutation of this operator

to immediately after one of the addresses mentioned in it, whereupon the occupant of that address plus the now immediately following sameness-operator takes as variant a pronoun or zero. This procedure makes it unnecessary to have any special grammatical statements for pronouncing and zeroing, given the metadiscourse operators of II 6,7. For a rather similar permutation is found within the non-metadiscourse material of sentences (III 2.4.2 below), and somewhat differently in permuting the subject-referring operators (III 2.6.2). And having a variant (pronoun or zero) for a particular word-sequence (word plus metadiscourse operator) is no different from any other case of a word or word sequence taking a variant. (That is to say, we do not need to state that a noun is pronounced "if it has the same referent as another" or even "if on the sentence containing it there operates a sameness operator referring to it".)

In particular, when the address-bearing operator above is on any single (two-or-more-argument) operator (wash, because, and, etc.) then it can move to right after either one of the stated addresses, whereupon **the** occupant plus the address-bearing operator together take an appropriate pronoun as variant:

The doctors' experience with lobotomy made the doctors avoid
lobotomy with 1.2. having the same word as 2.2

→ The doctors' experience with lobotomy with 1.2 having the same
word as 2.2 made the doctors avoid lobotomy

→ The doctors' experience with it made the doctors avoid lobotomy.

When the single operator is and, or, but and the two addresses have the same last numbers (i.e. refer to corresponding positions in the two arguments), and the address-bearing operator has moved to the address in the second argument (only), then the occupant plus the address-bearing operator together take the variant zero:

John can solve the problem and Frank will try to solve the problem with 1.1 having the same word as 2.1.1 and 1.1.2 having the same referent as 2.1.1.2

(argument 1 is can, 1.1 is solve, 2 is will, 2.1 try, 2.1.1 solve; 1.1.2 is problem, 2.1.1.2 is problem). With permutation (which is vacuously satisfied here) and zeroing, we have: John can solve the problem and Frank will try to.

When the address-bearing operator is on a pair of sentences (i.e. when it is an O_{00}), it moves to right after the address in its second argument (i.e. the second sentence), whereupon the occupant plus the following sameness operator takes the appropriate wh-pronoun (in some situations, that) as variant and there is a required moving of wh-pronoun (with any preceding N P--noun plus preposition) to the head of the second sentence. While there is no happy paraphrase for the connective status of the wh, we can write:

A man entered with 1.1 having same referent as 2.2 in I know a man

A man entered whom I know.

2.4.2 Second-sentence residue. In two of the above three cases, namely after and, or, but and in the wh case, the variant described in 2.4.1 produces out of a pair of argument sentences a second-place sentence in which one or more positions are apparently empty. This permits, and in the case of wh virtually requires, a further permutation of the residual second sentence (with the operator heading it: its and, or, but; and of course its wh) to next to the antecedent in the first sentence, i.e. next to that first-sentence address that had been given in the address-bearing operator which had created the second-sentence residue.

Specifically, the and-residue can move to before this address in the first sentence (before the last, if there are more than one sameness-addresses). In view of the corresponding-address requirement for zeroing under and, this means that the and-residue moves to right after the words in the first sentence whose corresponding words in the second have not been zeroed. Thus in John can solve the problem and Frank will try to the permutation yields John can, and Frank will try to, solve the problem, a form which is stylistically more

comfortable if the zeroed material was longer (i.e. if the antecedent of the zeroing, here solve the problem is very long, see III 2.7). If all but the first argument has been zeroed, the permutation is virtually required: John will solve the problem and Frank will solve the problem → *John will solve the problem and Frank → John and Frank will solve the problem. If the second argument but not its operator have been zeroed, the permutation is required: John heard the problem and John solved the problem → John heard the problem and solved → John heard and solved the problem.

In the wh case, the second-sentence residue is moved to right after the address in the first sentence (there can be only one here), i.e. to right after the antecedent: A man entered whom I know → A man whom I know entered.

The effect of this permutation, in the case of one-position residues under and, or, but, is to create conjoint word sequences which occupy, in the first sentence, the position of one word in it: John and Frank, heard and solved; and in the case of wh, it is to create modifiers to an antecedent which together with the antecedent--the "modified" word--constitute a word-sequence occupying the position of the antecedent in the first sentence. It will be seen in IV 3 that all modifiers, not only adjectival but also adverbs and subordinate clauses, come from this.

2.5 After zeroing of wh. After the zeroing of wh-is (III 1.3.2), which occurs only after the permutation to antecedent, certain short second-sentence residues can or must move further, to before the antecedent. This further permutation is required when the residue is what is characterized in 3.1 as A (adjective) with optional adverbs on it:

A man entered who is tall → A man who is tall entered → A tall man entered.

This includes adjectives (and certain adjective-like aspectual operators) which

have been attached to their arguments (III 2.5.1):

The audience is prone to receive things →

The audience is receptive to things →

The audience is receptive.

He will meet an audience which is receptive →

He will meet a receptive audience.

This permutation rarely takes place if the residue is what is characterized in 3.1 as preposition (with or without following noun) or adverb:

The man who is here phoned The man here phoned.

The permutation never occurs if what is zeroed is not wh- is but a wh- word alone: A man whom I knew entered. → A man I knew entered.

The permutation of adverbs and subordinate conjunctions (because, etc.) is due to this zeroing of which is. It will be seen in ^{IV}3.3 that He left hurriedly, which is because of her phoning him (or: because she phoned him) yields, upon zeroing of which is: He, because of her phoning him, left hurriedly; Because of her phoning him, he left hurriedly. When the antecedent (which has been pronounced into the which) is a sentence, the permutation of the second-sentence residue after zeroing which is can be either to before the immediate argument (i.e. the tense of the first sentence) or to before the whole operand (i.e. the whole of the first sentence).

2.5.1 Compounds. There is a particularly important case of this permutation when the residue is a noun (second argument) preceded by its appropriate or indefinite-appropriate operator (verb or preposition). As the residual noun (after the zeroing of III 1.4.2) permutes with its antecedent, this appropriate operator is zeroed and the antecedent received a reduced stress:

They developed an engine which is specially for (or: works with) steam →

They developed a steam engine.

This permutation occurs also when the above conditions (zeroing of of or certain other prepositions, between nouns) arise even not as a residue of zeroed which is. Thus:

His burning of books was typical → His book-burning was typical.

He is a teacher of physics → He is a physics-teacher.

(in both of these, the appropriate preposition was not an operator but part of the operand-indicator).

2.6 O_{no} position of O_o operators. There is a wide-ranging problem of O_o (or O_o -like) operators which occur not after their immediate argument but before it (i.e. between it and its own first argument): John can go (where can is an operator on go), John does sky-writing (where do is an operator on write). This different operator-position is due in some cases to a change in argument-requirement of an O_{no} operator that had originally been in that position (2.6.1) and in other cases to an alternative position for original O_o operators (2.6.2). The permutation in 2.6.2 can descriptively be treated as on the analogy of the position of 2.6.1, but there is no historical evidence of this. Nor is there a clean explanation in terms of likelihood for the distinction among O_o which do or do not have the alternative position.

2.6.1 The auxiliaries. The words can, may, etc. occur only in this position: John can go, John may go. Their sentence occurrences today are only slight modifications of their sentence-occurrences at a time when their object-requirements differed from today: can going back to an O_{no} operator, roughly 'to know', and may to an O_n or O_{no} operator, roughly 'to have power, to endure'. In most of their occurrences they have been specialized in meaning and requirement: so that the second (sentential) argument of can must have the same subject (first argument) as can itself does, this subject being therefore necessarily zeroed (the subject of go above is John); and so that may is connected to a following operator (as second argument or as connected sentence)

where again the subject of the following operator is always the same as that of may, and is always zeroed. We thus have in John can go a second argument consisting of John go with zeroed subject. The result is that can's argument requirement in historical English is the pair John, go, with go having John as subject, that is to say the content of a sentence John goes, or of an operator go with John as subject (even though the occurrence of John in John can go is an occurrence not of the subject of go, but of the antecedent of the subject go). The position of can is that of an operator whose argument is the pair John, John goes (*John can that John go), but its argument in historical English is a single sentence, i.e. the operator go with its argument John.

2.6.2 Permuted O_0 . There are several important sets of O_0 operators which, unlike can, may, occur in O_0 position, but also in the position of can, may: John's studying continued, John continued studying. Some of these occur also, somewhat marginally, as O_{no} : John continued the children's taking music lessons. In such cases it may be possible to consider John continued studying as being from John continued his studying, a zero-causative (IV 2) from John had John's studying continue, or the like.

For other O_0 operators there is no O_{no} form which can be explained in this way: John is able to drive, John's driving is an ability (of his). And there are O_0 operators which occur only in the pre-argument position: John is hunting (until recently also John is a-hunting, earlier also I am upon writing, etc.); John is gone; The jewelry was stolen by someone on the inside; John has gone; John has a walk; John does sky-writing; John can not write. We could seek paraphrases, as close to the given operator-words as possible, which would have the same strong selection or argument-domain restrictions as these operator words do (but could have additional weaker selection also), and which would occur in the usual position for an O_0 operator, e.g. (very roughly): for is (a-) ing John's hunting is~~on~~, is going on; for is -en: John's going took

place, The jewelry's stealing by someone on the inside took place; for has -en: John's going took place by now; for has a: John's walking is an item (or: an event); for does: John's sky-writing is regular (occupational) for not: John's being able to write is not so. The particular choice of operators in the O_0 position is not essential, pending our finding the closest paraphrase. They have to express not only the overt meaning of the pre-argument operator and match its selection, but also express its aspectual meaning; for all of these have an aspectual effect upon their argument verbs, as is seen not only directly--i.e. in the further operators which act upon them, but also indirectly (e.g. if we compare the meanings of all the -en suffixes, not only in is gone, is stolen, has gone, but also in faded, cultured, wooden, etc.).

The only point that is essential here is that it is possible to restate these out-of-place operators by operators in the usual position, not of course as sources but as inequality-preserving transforms. The additional effect of the out-of-place operators, as being operators on the subject as well as on the argument-verb, can be expressed by a metalinguistic operator on the restatement: thus for John is able to drive not merely John's driving is an ability but John's driving is an ability of the subject's. We can then say that the occurrence of such a metalinguistic (subject-referring) operator on a "correctly-placed" post-argument O_0 is the occasion for permuting the O_0 (with complete phoemic change) to before its argument, i.e. to after the referred-to subject. This permutation would be similar to those of III 2.4.

2.7 Length permutation. A quite different permutation provides that certain short operators (or operators plus their second objects) may permute to before long second arguments of their argument. Thus, given slowly as operator on read in John read the books we get John read the books slowly and not John read slowly the books. But if the second argument of read is lengthened by residues of wh- or and, or, we have a permutation to, e.g.

John read slowly the many books which were on the reading list. Also, if out operates on mailed in John mailed the clippings, we get John mailed the clippings out or, by relative length as above, John mailed out the clippings. But if this sentence is joined to another with a sameness operator on the clippings, the pronouncing is shorter so that it precedes out: John mailed them out, and not ~~John~~ John mailed out them.

2.8 Episodic permutations. There are certain permutations which are special to particular operator situations, and do not seem to be related to special likelihoods.

2.8.1 Permuted operand indicator; the passive.

Perhaps the most important is the permutation in the operand indicator (II 4). English has the following forms: (1) one ordering with the first argument first: The settlers' chopping trees (The settlers' tree-chopping is due to 2.5.1); (2) all orderings with the operator first: The singing of birds, Chopping (of) trees by the settlers, The chopping by the settlers of the trees; (3) and one ordering with the second argument first (The trees' chopping by the settlers). A somewhat different form of the operator being first is found when it is an O_0 operator in noun form: The fact of the settlers' chopping trees (or: of the trees' chopping by the settlers, etc.) from The settlers chopping trees is a fact. It may be that the choice among these forms is indeed stylistic, i.e. grammatically free and not due to any added operator. One of them is of great importance as the basis of the passive and of certain nominalizations whose relation to the passive is often unrecognized. The nominalizations are obtained by various N_s becoming suffixes on (3) The accused's acquittal by the judge, and on (2) The acquittal of the accused by the judge, as against on (1) The judge's acquittal of the accused. Other cases of N_s operating on (3) or (2), with characteristic by plus subject; on (3) Kissinger's appointment by Nixon, Nixon's impeachment by Congress, as well,

of course, as on (1) Congress' impeachment of Nixon), His election by the convention, His selection by the caucus, Their arrest by the police; on (2) The choice of model by the buyers. As to the passive and passive adjective, it is obtained when the is-en aspectual operator acts on (3). The accused is acquitted by the judge, He was elected by the convention, etc. (That the passive has particular aspectual properties, somewhat more durative than the corresponding active, is known from considerations such are adduced in IV 2 and IV 4.1.6. Note that neither (3) and (2) nor the passive exist for be, which is not an original operator, and for cost, weigh, etc., whose "object" is not really a second argument. There are languages which have something akin to a passive without having a permutation of type (3) in the operand-indicator. In these languages the basis for the second argument appearing in first place is different, and is in some cases related to a reflexive or middle form.

2.8.2 Special-word permutations.

When whether is replaced by question intonation as its variant, the tense morphemes will and -ed, -s (with do as their phonemic carrier) permute with the subject; if the -ed or -s are suffixed to be or to have-en (and optionally to have otherwise) they permute with these instead of getting the do-: Will he go?, Did he go?, Is he going? When not (or contrastive stress) appears before its verb argument (2.6), the tenses precede not as they precede the subject under the question intonation: He did not go, He has not gone, He does go.

There are several special permutations unrelated to likelihood, mostly optional, and many literary or rare rather than colloquial. The great bulk of these are of two types: object subject verb (This I can say, Firm she was, So it was that he agreed); and (for a special set of short adverbs) adverb verb subject (Nearby sat a man, Now comes the question, Little did he know, So am I; related to this is the There form as in There is a man here).

3. Required Morphophonemics. These are (generally) required variants-- not optional and not related to likelihood (i.e. reduced information)-- that certain operators and arguments take different (not necessarily shorter) phonemic shapes when they meet particular arguments or operators respectively. Thus knife has the form knive when operated on by the plural, and the plural morpheme has different forms depending on the final voicedness or simply the identity of the nouns on which it operates. Similarly, be has different forms under the different tenses, etc., and do has different forms under the tenses; this applies to them both as operators and as tense-carriers.

There are also cases of discontinuous morphemes (which appear as the requirement of "agreement"), which are more common in languages more inflectional than English. Thus if the first argument of an operator is a noun under plural or and, or is I, you, the present-tense -s of the operator is zeroed.

The operator be (as in Let it be.) occurs as tense-carrier for the operators (adjectives, prepositions, nouns) whose tenses are not suffixed directly to them (IV 3.1). It is this that makes every English sentence contain a verb. Also, in those situations in which operators receive tense-affixes as variants of time-order operators on them (III 2.1), operators which are under no time-order receive an -s tense: that is to say, the -s tense suffix is a variant of the time-order operator as (same time as) in certain situations and also of the absence of any time-order operator in those situations. It is thus that we have a present-tense in such time-less sentences as Two plus two equals four, and it is for this reason that every English sentence has a tense (even the imperative, e.g. Please speak up., when we go back to the operator that introduces the intonation: I request you that you please speak up, I request you: Please speak up.).

Finally, those "count" nouns (whether for objects, e.g. book, or situations, e.g. mistake) which have a high likelihood of being enumerated, i.e. of being operated on by a number-word, are required to carry a if they do not carry a deictic or quantifier or plural (IV 6.4,5) and are not second arguments of certain appropriate operators: the school, that school, some school, schools, a school all as subjects of closed down; but also School is good for you (from Going to school...); and The carpenter works at a school (or: inside a school, near a school, etc.) but The students work hard at school (here at is appropriate and cannot be replaced by any locational preposition).

All these required variants must be included even in sentences which take no optional variants, and which are otherwise constructed purely by the material of II above.