forms is frequently described ... as a process which ... in the time of the base or base-plus-suffix is described as a result of the process of suffixation. This is a traditional manner of speaking, especially in American Indian grammar. It has, of course, nothing to do with historical change or process through time: it is merely process through the configuration, moving from one to another or larger parts of the pattern.

Rigorous work with historical linguistics, as everyone knows, preceded almost all rigorous descriptive work; the carry-over of 'process' terminology from historical discussion is natural enough. In this country Roes (1961, p. 27 f.) established IP, and Sapir (1921, esp. ch. 4) elaborated it; the descriptive chapters of Sapir's Language are cast entirely in this mold. Grammars written largely under Sapir's aegis, such as Newman's Yukon (1944; the specific paragraph and some others are quoted above), still stand as examples of IP in action.

1.3. As a further example of IP, consider the following paragraph from Haas' shorter treatment of Tunicas (1946).

The Tunican language is mildly synthetic in structure. In its technique of synthesis it is for the most part assimilative, but it also employs a limited amount of fusion. The morphological processes used are juxtaposition, affixation (prefixation, infixation, and suffixation), reduplication, and supplementation. The process of prefixation and suffixation, particularly the latter, are explained to a greater extent than are the other processes.

There is no question about the meaningfulness of this characterization. Whether it is particularly relevant, either to a description of Tunican or to a proper placing of Tunicas in the gamut of linguistic types, and whether it is even necessary, is another matter.

1.4. The younger model, IA, has been formulated at least in part because of a feeling of dissatisfaction with the 'moving-part' or 'historical' analogy implicit in IP. At the very least, these analogies seem to imply that change proceeds by means of 'patterns' in a possibly arbitrary way. Critics of IP would prefer to circumvent such decisions altogether. For example, cf. Hockett (1947a, pp. 283-4), if it be said that the English past-tense form talked is "formed from talked by a 'process' of 'suffication', then no matter what declaration of historicity is made, it is impossible not to conclude that some kind of activity is being assigned to talk, as against either talked or the suffix. And if this priority is not historical, what is it? Supporters of IP have not answered these questions in a satisfying manner.

Another objection which might be raised to IP as exemplified in the above quotation from Haas is that the word talking, with its attached personal and teleological connotations, is a subject with such verbs is personalization; the use of such verbs seems to imply teleology—the language has a purpose to accomplish, and it makes use of such-and-such means to the end. If any entity 'uses' the techniques, it is the speaker, not the language. This objection is pointless unless it can be shown that such a way of speaking leads its users into errors of fact. So long as it is merely a 'way of speaking', easier than some other way because English is an Indo-European language, we cannot object.

1.5. The essence of IA is to talk simply of things and the arrangements in which those things occur (Harris 1944, section 5, esp. end of page 203; Bloch 1947, introductory remarks; Harris 1945b; Harris 1946). One advantage of a given language consists wholly of a certain number of grammatically similar elements, called morphemes, which in turn are arranged in relation to each other. The structure of the utterance is specified by stating the morphemes and the arrangement.

The essential difference between IP and IA is that if we list the morphemes and the arrangements in which they occur relative to each other in utterance—appending statements of the other shapes which appear in any occurrence combination.

The matter is not quite so simple as this. Some of the criteria are of course dependent on context. Here it must be noted that there is some indeterminacy even in the apparently trivial matter of deciding what to call nouns and verbs. In English, intonation phonemes can be taken as comprising parts of morphemes just as do vowels and consonants. There is then a set of morphemes composed entirely of intonation phonemes, and such intonation morphemes can sometimes overlap other kinds of morphemes, but simultaneously with them.

The possible criteria are examined by Pittman. 1949. But Pittman's discussion is cast in IA, and affords no obvious support for the IP approach.

Floyd Lounsbury has suggested (private communication) that we can profitably speak of the 'structure' of a word or utterance, meaning the 'patterns' in the language. This suggestion is followed here.

1.6. There is partial translatability between IP and IA, but the result of translation are apt to seem somewhat strange. By way of elaboration, here is the passage from Haas's Tunicas, recast in IA:

The problem of dimensionality is confusing. Recognizing that two morphemes, we have to accept simultaneously as one arrangement of morphemes related to each other. This, in turn, suggests that there is a second dimension of arrangement in addition to time; but there are no contrasts between different arrangements in this second dimension—no term 'superior' is no more apt than 'equals', and the bad language is not even better. Dimension in which arrangements are not in contrast is really this. Let us call it the dimension of arrangement (or conversion) that it is better to speak of just one dimension, with simultaneity as one possible arrangement within it. If we treat intonations (or stresses) as features of the word, we can then clearly we have more than one dimension. But in this case, although two items can occur in different positions on one axis, the two items cannot occur at the same time on different intonation axes. There is something rather queer about the added dimensions.
The average number of morphemes per word in [IA] is the highest and lowest averages known from various languages. This is probably due to the fact that a single word is the most frequent form in language, as for the most part relatively invariant in shape, but there are many exceptions to this rule. For example, the word morphemes fall into several position-classes: stems, prefixes, suffixes, and infixes, at least in one suffix. *We are not told which kind or how many*

A linguistic form is either simple or compound. A simple form is a morpheme. A compound form consists of two or more immediate components, which are not themselves compounds, and forming a constituent. Constituents and constituents in the following form recur in other compound forms (e.g., for an occasional unique constituent). Each constituent (a constituent, not a morpheme) occupies a position in the construction; each is the partner of the other(s). Occasionally it is convenient to regard a morpheme not as participating in any construction, but rather as a morpheme in the construction in which several forms occur.

Any succession necessitates a statement of the conditions under which the interpretation is to be accepted. Three such statements of conditions occur to me, the first being the trivial (but not unimportant) one of excluding the interpretation altogether.

The second is to allow the interpretation only where the marker indicates the boundary between partners in a construction, and in such a way that the marker is at least in part or from any great excess of merit of IA over IP, but rather from the following: (1) We like, nowadays, to be free from things that are not one's own; (2) one's IA has been formalized and IP has not. It is unfair to compare a formalized IA with an informal IP and conclude that the former is better just because it is formalized. It could be shown that IA is capable of formalization but that IP is not, that would be another matter. But in what follows, I hope to demonstrate that no such claim can be made.

To do this, it is of course necessary to devise a formalized version of IA. This will be almost our last step. It will be preceded by: a general outline of IA, in broad enough terms to cover most, if not all, of the current varieties; a survey of some of the problems implicit in IA (in two parts: tactical and morphophonemic); an excursion into certain elementary notions of mathematics, reeling analoges for IA and other possibly useful analogies. Our formal version of IA will be derived from such an analog. It will then be possible to assess the relative merits and defects of IA and IP.

II. ITEM AND ARRANGEMENT

2.0 The following outline of IA might be called “formalistic”—not so formal as to qualify as “postulates,” but succinct rather than discursive. The model is a linguistic structure in the present paper (or by any set of statements which can be transformed mechanically into this form).

2.1 A list of words.

2.2 Under each construction as heading,

2.2.1 Enumeration of the positions in construction, (2) Specification of any marker for that construction.

2.3 For each position,

2.3.1 A list of the morphemes which occur there.

2.3.2 A list of the constructions, composite forms belonging to which occur there.

2.4 Occasionally it is convenient to regard a morpheme not as participating in any construction, but rather as a morpheme in the construction in which several forms occur.

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2.7 The alternations in shape of a morpheme are predictable in terms of the environments in which it occurs (plus, of course, the morphophonemic statements which one makes).

2.8 All the phonemic material in a utterance is accountable for in terms of the morphemes which compose the utterance and the arrangement in which they occur relative to each other. (Hockett, 1940, section 3.)

2.9 It is possible to use devices as following the where they prove convenient:

2.10 The statement of shapes, alternations, and conditions of alternation describes the morphophonemic pattern of a language.

2.11 Morphophonemic and morphological patterns together constitute grammatical patterns. This, paired with phonological and morphological systems, comprehends the pattern of language. The cleavage between phonology and grammar is thought by some (including myself) to be more fundamental than the distinction between morphophonemics and syntax, even though, for some purposes, other stratifications are possible. For example, it is sometimes convenient to class morphophonemic and phonological facts together, as “mechanics,” in collective contrast to tactics (Hockett, 1954).
Charles F. Hockett—Word 10, 1954

The above outline, it also makes a good deal of sense to class automatic morphophonemic facts with phonological, non-automatic with tactics; I have no labels to precede the parts of the classification of this (the classification which seems to be implied by certain of Sapir's discussions: 1933, 1935). In any case, there are interesting points about the structure of the lines of demarcation between levels, but we need not concern ourselves with them here because the formal and semantic levels will solve them neither more nor less than does IA.

III. TACTICAL DIFFICULTIES WITH IA

3. A grammatical description built according to the plan outlined in II eft forth principles by which one can generate any number of utterances in the language; in this sense, it is operationally comparable to the structure of that portion of a human being which enables him to produce utterances in a language; i.e., to speak. It is also comparable to a cookbook. From the lists of the tactical description, choose any set of compatible ingredients. Put them together, two by two or few by few (ICs), until all have been tentatively assembled; then treat in accordance with the morphophonemic statements (in cooking, 'cream', 'bland', 'brill', etc., remove traces of these operations (clean and put away the cooking utensils); and one has an utterance in the language. In cooking, a difference in the sequence in which ingredients are put together in the end-product, if these were not too, manufacturers of processed foods would not announce, as they sometimes do on packaging, both ingredients and proportions. But there can also be differences in sequence in cooking operations which make no discernible difference in the end-product. For the moment this second fact is of primary relevance for the analogy. There is, in linguistics, no guarantee that different sequences of operations performed on the same input will produce identical linear sequences of morphemes, we can regard the matter of hierarchical structure as an internal part of the syntactic description. If we assume that the syntax and the meaning of a word is independent of its linear position in a sentence, then we are forced to conclude that hierarchical structure is at most a convenient shorthand for describing a complex sequence of morphemes. One of the main purposes of a language, but simply a way to make our description of the whole language less cumbersome—an intrusive artificial artifact, like the illogical 'last' on the English alphabet. However, it would be possible (save for lack of time) to specify all arrangements of ultimate constituents in utterances without resort to any intermediate groupings.

Weil 1947, p. 93 (191). Since English morphology leaves out certain grammatically significant features of utterance (e.g., intonation), any single English notation, such as 'old men and women', subsumes ambiguously a wide list of facts. Some members of this family are marked clearly as having one IC structure; some are marked equally clearly as having the other. But, at least for my own speech, there are two families that are not marked in either way. In the context, it is of course one of the two that we hear; the other is less typical here, and in similar situations later, the reader must assume that this is the case.

The IA picture is therefore potentially somewhat more complex than our original emphasis on the two notions 'form' and 'arrangement' would imply. There are many potentially independent factors that are not related to any of those two. Specifically, there are (1) forms, (2) linear order, (3) constructions, and (4) IC or hierarchical structure, and that they map onto the status of these factors relative to each other. Are they all 'primitives' for the system, or are some derivable from others?

The independence of forms and order is clear almost from the outset. Such a trivial example as John hit Bill versus John hit Bill demonstrates the independence of form from order; the former versus Bill hit John demonstrates the independence of order from form, since these two could be said to differ only as to order of ultimate constituents. But the status of constructions and of hierarchical structure needs further discussion.

3.1 Beginning with hierarchical structure, let us consider again Weil's case of hierarchical ambiguity, this time embedded in a longer utterance: The old men and women stayed at home. It is quite possible that if I say this to an audience, some hearers may conclude that I have referred to old males and all females, others may believe that I have spoken of all old people of both sexes and all ages. Some may believe that I am referring to old males and all females, or that I am actually to be understood as a single entity. Any of these conclusions is possible.

Weil 1947, p. 90 (191). This is an important difference between The old men and women and The old men and old women stayed at home. The former is unambiguous; the latter is ambiguous. The ambiguity here, and in similar situations later, the reader must assume that this is the case.

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3.2 One recently proposed type of morphemic analysis turns on the 'primitive' status of hierarchical structure in a way which has never been made clear. It is the utilization of discontinuous morphemes (Harris 1945a). For those to whom this type of analysis appeals, this dependence, to be determined, is weight added to the desirability of recognizing IC-structure as a 'primitive'. But since there is no situation in which the distinction between discontinuous morpheme-analysis, its dependence on IC-structure cannot be seen as evidence for the status of the latter.

Consider the following two Latin sentences: (a) pater bonum filium amat; (b) pater bonum filium amat. The latter, though unusual, was certainly possible; it is easier to handle than more complex and more realistic examples that could be found.

According to the more customary procedure—rejecting discontinuous morphemes—the ultimate constituents of (a) include two occurrences of a morpheme that we may call [nomina] and one occurrence of [accusative], while those of (b) include one of [nomina] and two of [accusative]. The distribution of the two occurrences of [nomina] in (a) marks pater and bonum as going together as partners in a construction, while the distribution of the two occurrences of [nomina] in (b) marks pater and bonum and filium in the same way. The hierarchical structure in each case is partly marked by the nature of formation of these morpheme-occurrences.

There is no need, in these examples, for hierarchical structure to be an independent primitive.

One may call any single occurrence of a morpheme a synonym, but the results are different. The ultimate constituents of (a) in this case include one occurrence each of [nomina] and [accusative] and one occurrence of both, but in (b) there will be found, also, just one occurrence of each of these morphemes. In (a), the one occurrence of [nomina] is an occurrence in the basic form, the representation coming at the end of the two successive words; in (b) similarly for the [accusative] morpheme.

None of these sentences, then, is self-contained in the meaning. It is not enough that we be able to predict that if the stem pater-...bon-...[nomina] and the specification that the first to be predicted in any one occurrence and the precise location of those representations, to be predictable on the morphemic level. It is not enough that we be able to predict that if the stem pater-...bon-...[nomina] co-occur, the total form will be pater bonum. We must also be able to predict that if the stem sequence pater-...bon-...[nomina] co-occur, the total form will be pater bonum. Now assume that we have the partial pair-...bon-...[nomina] and...

10 These morphemes, treated as discontinuous or not, are what Harris has called morphemic components. Thus these examples distinguish the present argument (see 2.9 (3) of this paper), one occurrence each of [nomina] and [accusative]. There is absolutely no way of knowing that the total form will be pater bonum filium amat, or pater bonum filium amat. The representation of discontinuous morphemes is not predictable in Latin unless hierarchical structure is allowed to count as part of a relevant environment. When we make use of discontinuous morphemes, Latin than sentences (a) and (b), despite overt phonemic differences, are structurally the same as the two English phrases of shape old men and women.

The requirement of 2.7 was intentionally phrased broadly enough to allow this. However, it has not been customary to do so with pronunciation, environment and may that the necessary added complication will be enough to turn some against the position that morphemes are, in general, independent.

3.3 Next in line is the status of constructions.

Given verb-stem take and the past-tense morphemes, with instructions, the subject is to go together, only the one thing one can do is to put them together asooked. There is no problem of hierarchical structure since each constituent is ultimate. Linear order is determined.

Given John and saw to put together, the result would be either John saw or saw John (either of which, partnered by a preposition, will occur as an utterance). Here there is a choice of procedure. If to John and saw we add a specification as to linear order, then there is no longer any choice between constructions: only John saw, which is the actor-action construction, is properly specified. And only saw John (action-goal construction) is possible with the other. But instead of approaching the matter in this way in the first place, we specify the order as determined by the construction: John saw, and subject-predicate construction result necessarily in one linear order and action-goal construction result necessarily in the other. Whichever course we follow, it is clear that we are confronted with one more variable than the maximum number which can be regarded as independent: forms to be partners, order, and construction cannot in such a case, all be independent of each other.

The nearest example to complete independence of these three matters that I have so far discovered is in Chinese. Given cran3 'to fry rice', fan3 'rice', and the specification that the first to be noticed is the second, there is still a choice of construction—though it does not make any of its own way within the sequence itself. One possible construction is verb-object, giving cran3 fan3 'to fry rice, fan3 'rice'; the other is an abstract, cran3 fan3 'to eat rice, eat rice'. These are really different: the first is the also the construction of cran3 fan3 'to eat rice, eat rice', unambiguously verb-object; the second is also the construction of fan3 cran3 'good rice', which is unambiguously attribute-head.

From these examples, it is clear that old men and women applies pari passu to cran3 fan3, need not be repeated in detail. There are, of course, some language facts for which this is not the case. For instance, fan3 cran3 is unambiguously as one or the other construction, just as there are larger environments in which the hierarchal construction is allowed to count as part of a relevant environment. But there are still larger contexts in which the ambiguity remains. The construction, then, can not be regarded as determined—just so long as fan3 cran3 is involved in the order. The reverse is possible: given forms and construction, the order can be regarded as determined—it just so happens that either of two constructions, with the same two constituents, results in the same order.

The conclusion to which we are forced is that, at least in some cases in some languages, choice of construction is a primitive.

3.4 If a particular version of IA allows the recognition of marked constructions, then the question as to the primitive or derived status of constructions becomes trivial: at least such constructions as have markers must have primitive status. Consider John and Bill, a bipartite construction with marker and.

This form contrasts with Bill and John only as to form, and with John or Bill only as to construction—since only is the marker of a different construction. In this language, then, the two forms are independent. It immediately follows that in old men and women all four factors are independent, since in addition to the 3, we have two more different factors. The matter of hierarchical structure, therefore, demonstrably independent of the other factors.

5. So far we have been concerned with the status of which we set out to survey, all have to be recognized as potentially independent, and therefore as primitive. If there is really no reliable way of knowing how new occurrence in the order—one of the two factors (the other being form), which would seem so obviously primary. The only construction discussed so far, in which linear order had to be accepted as independent of all other factors was in the case of marked constructions like cran3 fan3 and fan3 cran3, to choose marks construe marked constructions altogether.

The survey also shows, however, that in the bulk of cases not all of this machinery is needed. In most cases, a determination of two or three of the factors leaves no choice for the remainder. It is this fact which gives rise to the most embarrassing tactical trouble inherent in IA: machinery which has to be in our workshop for use in certain marginal cases tends to obtrude itself when it is not needed. Thus Bloch writes as follows (1947, 400-426): 'the prettier form wanted...can be described as follows: want...wanted...for cran3 fan3 and cran3 fan3, occurring in that order. The meaning of the first morpheme is a particular action that we need not specifically define here; that of the second is "past time" or the like. The constructional meaning of the order in which the two morphemes occur is approximately "want...to eat certain time". Bloch has cut down on the total amount of machinery by identifying "construction" and "order" (which, as was has been, is in general questionable). But, still, entities are multiplied beyond necessity. Given the morphemes /want/, /ed/, /at/ to be put together, ac- cording to IA, the construction is to be said at all as the tactic- cal level. There is no possible linear order save that of /want/ first and /ed/ second. Nor—if we separate construction—is there any choice of construction. Semantically, it is quite pointless to break down the meaning of the whole form waited into three parts: structurally, there are two and only two independent variables, and the only valid procedure is to assign, as the meaning of the second vari- able, everything that differentiates the meaning of waited from that of wait.

IV. MORPHOPHONEMIC TROUBLES WITH IA

4.1 Most morphophonemic problems find simple answers in IA, for there is available a wide variety of morphophonemic techniques all within the bounds of the IA model. However, there is a refractor- ary residue, troublesome not because no solution can be found, but because the techniques of morphophonemic solutions present themselves, no one seeming much better than another, or because the intuitively best ones do not work. The point we are making is that the morphophonemic analysis is in detail only one of these, and took will do.

4.2 The following morphophonemic solutions have been noted (in the main, Bich 2947, p. 400-1 (4263))

1. (1) took is a single morpheme, so that there is no morphophonemic problem.

2. (2) took is a portmanteau representation of the two-morpheme sequence take and /ed/. This is a single morpheme which appears elsewhere as take, plus a zero allomorph of /ed/.

3. (3) took is a discontinuous allomorph /t/ of take, and an inflected allomorph /s/ of /ed/. (real, replaced, etc.)

4. (4) took is plus a complex morph /s/-/ed/ (real, replaced, etc.)

Let us consider these one by one.

1. (1) is unacceptable because it does not correctly the tactical parallelism between took and baked and many other obviously composite forms.

2. (2) is the most general solution, simpler to avoid, in the problem of identification of partial similarity in shape. But this very avoidance is arbi- trary: took and take are partly similar in shape, though not so similar in meaning also in the same way; the fact should not be obscured.
TWO MODELS OF GRAMMATICAL DESCRIPTION

5.3 Another great class of mathematical systems are characterisable as consisting of a set of elements for which certain operations are defined. One such system has, as did our exemplification of a system with relations, the positive integers as its elements, and has, as one elementary operation, that of addition. Addition applies in the first instance to pairs of positive integers, and is therefore a binary operation: two plus two is four, three plus four is seven, and so on. Addition has certain properties. For instance, it is commutative: we get the same result adding two and three whether we start with the two or with the three. The operations which are not commutative, e.g. subtraction defined over the same set of elements, since five minus seven is not seven minus five, but actually meaningless. Addition is also associative: (2 + 3) + 4 is the same as 2 + (3 + 4) and this is the same as the commutative property. The law of the one can be dropped, and the operations take on the appearance of not being binary at all, but of applying to any number of terms, or more. Furthermore, however, it is convenient to regard addition as binary. It can be shown that operations are reducible to relations, so far as their logical status is concerned. Thus the binary operation of addition, by which 2 + 3 + 5, can also be interpreted as a ternary relation holding between the ordered triple of numbers (2, 3, 5) and between any ordered triple of numbers (a, b, c), for instance (2, 3, 5). In general, any n-ary operation is logically reducible to an appropriate (n + 1)-ary relation.

5.4 If 'relation' is our closest analogue to 'construction', then certainly the linguistic analog to 'operation' is 'procedure'. A grammatical model constructed in terms of this analogy ought to differ from IA just as operations differ from relations: it should be dynamic instead of static. It was this need that was one of the chief characteristics of the older informalized IP model, and we shall see that it is retained in the formal version about to be presented.
VI. ITEM AND PROCESS

6.0 The statements which follow parallel, as much as possible, those of II, and are abbreviated where reference to II can easily serve to fill them in; examples are left for VI.

6.1 A linguistic form is either simple or derived.

6.2 A simple form is a root.

6.3 A derived form consists of one or more underlying forms to which a process has been applied. The underlying forms and the process all recur (e.g. for success), in other forms. The underlying form or forms (or are) the immediate constituent(s) of the derived form, which is also called a constituent; each underlying form is said to occupy a given position; each, if there are more than one, is the partner of the rest.

6.4 Some of the phonemic material in a derived form may be, not part of any underlying form, but rather a representation or marker of the process. Such markers are called roots.

As in the parallel statement for IA (2.4), this necessitates a statement of conditions; we defer this to VII.

6.5 The tactical patterns of a language is completely covered by a set of statements of the following form:

(1) A list of the processes.

(2) Under each process as heading,

(a) (2.1) Enumeration of the position or positions that occur.

(2.2) A list of the rules which occur in that position, and

(2.2.1) A list of the rules which occur in that position, and

(2.2.2) A list of the processes which produce it, and which occur in that position. There is no analog to statement (2.2) of section 2.5.

6.6 A root may appear in more than one simple phonemic shape. A single shape of a root is a root-alternant.

A process may have more than one representation. A single representation of a process is a marker.

A marker consists of the difference between the phonemic shape of a derived form and the phonemic shape of the underlying form or forms. That is, a marker may consist of phonemic material in some specific position relative to the phonemic material which is identical with that of the underlying form, or it may consist of something present in the derived form in place of something else present in the underlying form, etc.

6.7 The alternations in shape of roots, and the choice in a particular instance of one or another marker of a process, are predictable in terms of the environments in which they occur (plus, of course, one's morphosyntactic statements).

'Environment' is defined as in 2.7.

6.8 All the rules which constitute consonant alternation are accounted for in terms of the roots which occur in the utterance and the processes to which they have been subjected.

6.9 Empty root-alternants, partomante root-alternants, and links are definable and allowable as in IA. Should it be desirable, 'Sapir's' spelling of alternant roots and zero markers of processes are likewise allowable, under similar limitations.

6.10 The statement of shapes, alternations, and conditions of alternation describes the morphophonemic pattern of the language; further considerations remain as in IA (el 11).

VII. COMPARISONS

7.1 First we give examples of IP treatment.

(1) Baker is derived from a single immediate constituent base, which happens to be a root, subjected to a singular process which we can simply label 'past-tense formation.' This process has various markers; when applied to *bake* the marker is a /t/ which follows the phoneme of the underlying form.

(2) *Tobs* is tactically like *bake*, with underlying form *tab*, is *bake* but applied to a different word. The morphophonemic difference is that the singular process in question has a marker consisting of substitution of the stem vowel */a/ *of* the underlying form by /t/.

(3) John and *jaw* is subjected to the binary process of resolution, give *John Jaw* necessarily with that order, and with that marker unless the order *be* taken as a marker. The same forms, subjected to the binary process of resolution, give *jaw John* again with order determined and zero marker. As with IA, we could alternatively take the order as primary and the process as determined. In support of the latter, there are many comparable cases in mathematics. It is evident that, when process occurs in a language, we may here take advantage of the facts that in IA we could also have different orders, and that in that language the orders are, in general, irrelevant. If we allow order to be determined and then treat the derived form as a process, we are clearly justified in doing so. The difference between the IA and the present order is, I believe, the essential difference between the two languages.

7.2 Our IP model differs, at least superficially, from that of IA. We shall not attempt to describe the contrasting grammatical features of IA as well.

This is partly because we have tried to incorporate into the more formalized version of IP some of the results of recent investigations carried on within the IA framework. Mainly this means the contrast between a morphologi- cal and morphophonemic positions, which does not exist in IA (2.5). *Sapir's* writing or in Bloomfield's "1933" discussion. It would be a loss of ground to expunge this contrast during the reconstruction of IP.

But its retention leads us to the term 'process' in a way different from Sapir's use. For Sapir, such things as vowel-change, suffocation, reduplication, and the like, were 'processes.' For us 'vowel-change' refers to one possible (canonsal) form of a marker, a canonical form represented both in *map* and *map* and in *tool*, whereas in IA the marker in *tool* and the marker in *tool* represented the same process in our sense, are of different canonical forms and thus would be different 'processes' in the Sapir sense. Nida's (1946) earlier contrast (derived closely from Sapir) between 'phonological process' and 'morphological process' is another manifestation of our contrast between canonical forms of markers, on the one hand, and, tactically relevant processes on the other. All this is easier to say, and at the same time perhaps less necessary, had we abandoned the term 'process' and simply imported 'operation' from something quite new in the writings of IA (7.2.4) as a direct splitting-off of Sapir's model for the treatment of 'process' in the light of recent developments.

7.3 The examples of 7.1 show that, by large, grammatical differences that occur in IA will parallel, to those cast in IA. There will be slight differences in terminology, and the wording certainly gives a "dynamic" rather than a "static" feel to the statements. Apart from these matters, the main differences will be marginal—though perhaps crucial. For example, the major tactical and the major morphophonemic difference are not at all confronted with superfluous machinery in the case of a new root. In Baker's case the IA is singular, so that the only factors are the respective underlying forms and the process. The morphophonemic differences, as well as IA, are explained by both. Since the whole frame of reference is one in which the differences between *tool* and *tool* is just as acceptable as that between *baked* and *bake*.

On the other hand, IP makes for certain differences avoided by IA.

In the first place, a pure 'IA approach (which bars the interpretation of any morphemes as markers of constructions) is clearly much more homogeneous than either a less pure IA, or IP. This homogeneity is not as simple as has been thought: 'items,' true enough, are either morphemes or sequences of morphemes, but still one has to contend with the independent status of order, constructions, and hierarchical structure. Even so, there is a clear difference between taking some phonemic material as 'root,' or 'item' and some as 'marker' of processes, as IP requires, and the simple procedure of taking all phonemic material as 'markers' or as a single or more phonemically irrelevant and morphophonemically predictable.

The problem of novelty, evaded by IA, comes back into the picture. How are we to decide? In what conditions to interpret a derived form as involving two or more underlying forms and a binary or higher-order process, and under what conditions to interpret it as involving a single underlying form and a single (binary) process? In current IA terms this is an extension to the case of two versus one of a problem found in IA: when do we recognise three ICs rather than two?

The answer probably lies partly in the cases which are solved more easily by IA than by IP. 

Baked and joke are interpreted in terms of a singular process because to do otherwise leads to tactical and semantic trouble in both cases, and to morphophonemic trouble in the second. Obviously cases will be found more difficult than these, and a full elaboration of the necessary criteria is not to be expected overnight. In this very connection, IP is sure to encounter its refractory residue, different in content from, but similar in implications to, that of IA.

7.4 Another contrast between IA and IP turns on the number of constructions one has to recognise for a language under IA, versus the number of processes necessary for the same language under IP. Theutteration of economy seems never to be invoked in IA as far as the number of morphemes is concerned:

there are in any case a great many morphemes, and
If we were confronted with two models, one of which fulfilled all the above requirements while the other did not, choice would be easy. If we were confronted with two, both of which fulfilled all the requirements, we would have to conclude that they differed only stylistically. Neither of these situations, of course, is at present the case. Neither any existing version of IA nor any existing version of IP mets all the metrical criteria. Insofar as such matters can be felt quantitatively, it seems to me that IP, as constructed here, comes at least as close to satisfying the requirements as IA does. Though perhaps no closer, in other words, what we have here is a two modal experiment, or with the devising of further models too, for that matter—looking towards an eventual reintegration into a single more nearly satisfactory model, but not forcing that reintegration until we are ready for it.

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[The Chinese examples were originally given in two different spellings; here they are normalised to the pattern used in Hockett's Peking morphophonemics (1950), which he had already used for the first (1950).]