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Approaches to affix order*

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Abstract

This article is an attempt to survey a number of recent approaches to affix order, compare the scope of their empirical predictions, and illustrate them with data from Quechua suffixation. One approach in particular, in terms of a matrix of fixed slots, is criticized on both empirical and theoretical grounds, and various alternatives to this approach are tentatively explored.

The last 20 years have shown a dramatic increase in our knowledge of the structure of complex sentences, but a virtual standstill in our knowledge of the structure of complex words. The main reason for this, we feel, is a historical accident: the languages subject to concentrated linguistic scrutiny do not possess the type of complex morphology involved. At the same time, such impressive headway was made with respect to the syntax of the Indo-European languages, and so little with respect to their morphology (which appeared to be a finite system full of exceptions and idiosyncrasies), that morphology within the generative tradition came to be regarded as something essentially uninteresting, from a theoretical point of view.

Given the complexity of the systems involved, the latter view will almost certainly turn out to be a mistake. Apart from the Eurocentricity of the morphological research tradition up to now, three other factors have held back research on the structure of complex words: the absence of modular approaches, the lack of reliable data, and conceptual confusion.

To illustrate the problem of the lack of modularity of affix-order studies, we can point to similar problems in the study of word order. In syntactic models word order is accounted for essentially through phrase-structure rules. Listing the order of elements in a string through postulating it in a rule adds nothing to our understanding of the order itself. Only since, in the late 1970s, an attempt was made to decompose word-order patterns into a number of different modules — X theory, directionality of
government, adjacency of case assignment, constituency, positioning of scope-bearing elements, extended word formation, and constituency — has it become possible to study word order in a meaningful way (Stowell 1981). In the same way, I expect, it will turn out that affix orders are not due to one overriding principle but result from the interaction of different modules.

A major handicap for all the work in this area has been the lack of adequate data. Very few systems of complex verbal morphology have been described at all adequately, and in no case do we have data on impossible affix strings. The lack of data is not surprising if we consider the enormous number of pages that would be needed to list all the affix combinations possible in complex systems. Again, when we compare word structure to phrase structure, it is obvious that it could not be otherwise: grammars are complex statements that stand in lieu of lists of possible combinations. But at present we lack such grammars for words and need the cumbersome lists.

A third handicap that has held back work on affix order so far is conceptual confusion. This confusion results from the fact that it is not clear what it means for an affix to be external to a given (simple or complex) base form. Some researchers have referred to the 'scope' of an affix, even where its meaning does not resemble that of a logical operator. In other cases terms such as 'semantic effect' or 'semantic relevance' have been used, again without clear definitions of what was meant. The general intuition that the position of an affix has implications for its functioning probably refers to a cluster of essentially dissimilar phenomena. These need to be separated, and I will attempt to make a beginning with this at a later point.

The paper, which is little more than a report on work in progress, hopes to accomplish three things:

(a) sketch and briefly comment on a number of approaches to affix order in the recent literature;
(b) argue that one traditional approach, in terms of a matrix of fixed slots, faces a number of undesirable consequences;
(c) tentatively describe a number of alternatives, to be pursued in future work.

**Linguistic approaches**

Why (1a), and not (1b) or (1c)?

(1) a. trans — form — at — ion — al
   b. *ion — trans — al — at — form
   c. *al — form — at — ion — trans
This question was posed for the generative research paradigm by Halle (1973), and both stipulative and principled answers have been forthcoming (although the dividing line is not always clear).

A first set of answers centers upon the fact that in English there seem to be two types of affixes: stress-shifting ones and stress-neutral ones. This typology has been utilized in descriptive statements of the following type:

(2) a. ‘+ affixes are interior to #affixes’ (Siegel 1974) (this statement is implemented essentially by the ordering of components).
   b. ‘root affixes are interior to word affixes’ (Selkirk 1982) (this statement is implemented through a phrase structure system for words that embeds roots inside words).
   c. ‘level I affixes are interior to level II affixes’ (Kiparsky 1982) (this statement is implemented in the framework of a morphology that involves a series of ordered levels).

A second set of descriptive statements derives from the observation, made frequently, that morphological processes that have the semantic function of deriving words are found closer to the lexical nucleus than processes that function to relate a word to its syntactic context. Recently Anderson (1982) has once again incorporated this observation into a grammatical model which has two levels relevant to lexical insertion: derived words are inserted before the transformational component, and inflection is spelled out after the transformations, for example at the beginning of the phonological component (PR). This leads to the following theorem:

(3) Derivational affixes are attached earlier in the derivation of a word than inflectional affixes.

A similar type of theorem is deduced in models in which lexical operations are explicitly accounted for, such as lexical-functional grammar and relational grammar. This has led Baker (1985) to produce the ‘mirror principle’ and Gerts (1982) the ‘satellite principle’. Both can be informally stated as

(4) The order of the affixes in a complex word reflects or mirrors the derivational ordering of the syntactic or lexical operations that they encode.

Approach (4) shares with (3) the idea that it is the organization of the total grammar (rather than just the morphological or phonological component) that accounts for the order of certain affixes.

Cognitivist views of grammar have resulted in approaches to affix order in which the affixes are classified according to their ‘cognitive relevance’ to the lexical nucleus and then assumed to be ordered according to their degree of relevance (see particularly Bybee 1985).
(5) The more 'relevant' an affix is to the meaning of the root (from a cognitive point of view) the closer it will be placed to the root.

A related way of thinking has attempted to connect affix order to the semantic scope of affixes, and to the theory of compositionality in semantic interpretation. In this view, semantic scope is interpreted within an explicit theory of semantics rather than a cognitive system. Exponents of this view include Muysken (1981), which deals with the interaction of reciprocal, reflexive, and causative morphology in Quechua, and Pesetsky (1985), which deals with a variety of morphological processes. The latter also formulates a rule of affix movement in logical form, which has the effect of correcting the scope of an affix.

(6) If affix p has scope over affix q, it is external with respect to affix q. Note, of course, that the possibility of moving affixes in logical form risks undercutting the empirical content of (6): the surface order of affixes can be arbitrary if we allow unlimited movement.

An approach that has been used successfully to account for the order of Romance clitics is that of the positive output filter, as formulated by Perlmutter (1974). The Spanish clitics, in this view, can be combined in any way (that the syntax and semantics of the clause allows, to be sure), as long as they conform to (7a):

(7) a. se I II III
    b. A B ... N

(7b) represents the general format of the type of positive output filter envisaged by Perlmutter. Here A ... N are variables ranging over morphological elements or classes of elements characterized by a particular feature.

It is clear from this list of approaches to affix order that they stem from a wide range of different theoretical perspectives and that they have very different empirical domains. Schematically the domains of their relevance can be sketched as in (8):

(8) \[
\text{ROOT} \ (\text{der}_1, \ldots, \text{der}_r) \ (\text{inf}_j, \ldots, \text{inf}_i, \text{cli}_m, \ldots, \text{cli}_n) \]

Principle (2) refers to the ordering of some derivational affixes and principle (3) to the relative order of inflection and derivation.

Principle (4) refers to suffixes which would on most counts be inflectional affixes. Of course, it is not immediately clear whether the notions
‘inflectional’ and ‘derivational’ carry over from grammatical model to grammatical model. In fact, they probably do not. This is not so relevant at this point, however, since neither (4) nor (5) nor (6) is stated in terms of inflection and derivation specifically. Principle (7) is formulated to deal with elements at the margin of the word but could well be extended to a wider range of distributional data.

Quechua morphology and the slot matrix

In fact, this is roughly what has been done in the descriptive literature on affix order. The primary stipulative descriptive mechanisms that have been proposed for complex morphological systems such as the Quechua system is the slot matrix.

In Quechua we have complex verb forms such as the one in (9), consisting of a root followed by a number of affixes.

(9) yacha — chi — na — sha — ku — n — pis
    know CAU REC REF PR 3 PL IND

‘They are teaching it to each other as well.’

A typical group of verbal suffixes is presented in (10):

(10) -mu (movement toward, away from speaker)
    -pu (benefactive)
    -chi (causative)
    -naya (desiderative)
    -ysi (help ...)
    -na (reciprocal)

Yokoyama (1951) proposed 19 slots for the Quechua verb, into which affixes can be put. Schematically, this proposal can be represented as follows (the proposal itself is listed in Figure 1, but the details are not so relevant at this point):

(11) 1  2 3 ... 19
    ROOT afl af19

The affixes are divided into classes that can go into a particular slot. No slot can be occupied twice. A subset of slots can be filled at the same time, as long as the numerical order is preserved. This yields a large number of possible strings of affixes.

In spite of the prima facie descriptive simplicity of such a solution, it suffers from both empirical and theoretical defects. Empirically, the wrong predictions are made in a number of situations:
Figure 1. Distribution of the Cuzco Quechua affixes (from Yokoyama 1951)
(a) A number of affixes can occur in various orders with respect to each other, and this is excluded in the slot matrix approach.

In work carried out with Kwee Tjoe Liong at the University of Amsterdam we developed a series of computer programs that discover various patterns in a given corpus of complex morphological forms. When presented with a list of Cochabamba (Bolivian) Quechua complex verb forms (Herrero and Sánchez de Lozada 1978), the program yielded a list of 51 affix combinations (involving 20 affixes) that occur in both orders (Kwee and Muysken forthcoming).

(b) There are numerous cooccurrence restrictions that would have to be stated independently of the slot matrix.

Again, in the work carried out with Kwee Tjoe Liong, we found a substantial number (67) of nonoccurring combinations. I should add immediately, of course, that it is not clear that all these combinations are actually impossible.

(c) In many forms, the same element can occur twice.

In the Cochabamba Quechua corpus, six affixes occur twice:

(12) yku decisiveness
    ra many objects
    rpa diminutive
    rpari
    chi causative
    rqo action with force

The variable order, the cooccurrence restrictions, and the repetition of affixes are all problematic for a slot matrix model, from an empirical point of view.

The slot matrix model also suffers from a number of theoretical problems, of various types:

(d) It is a primarily descriptive device, rather than an explanatory one.

(e) The slot matrix is formally equivalent to a rewriting system with a large number of positions to the right of the arrow. This suggests a very flat structure. The phonology (vowel lowering and shortening rules, see Adelaar 1977) and the semantics (phenomena of variable ordering coupled with different semantic interpretations, which only scope differences could produce) imply a nested constituent structure.

An example of this was presented in Muysken (1981), a study of Quechua causatives. Three affixes are involved, given here with their possible interpretations:

(13) na mark an element as a reciprocal anaphor
    chi add a causative predicate
    ku coindex the subject with one of the other arguments
These three affixes can be combined in three ways:

(14)  a. riku — na — chi — ku — n — ku
     see      REC CAU REF 3   PL
     ‘They caused them to see each other.’

     b. riku — chi — na — ku — n — ku
     see      CAU REC REF 3   PL
     ‘They caused each other, to see them.’

     c. riku — na — ku — chi — n — ku
     see      REC REF CAU 3   PL
     ‘They caused them, to see each other.’

With respect to forms such as these the crucial point is that their interpretation depends on the successive addition of affixes. In (14c), for example, the embedded verb ‘see’ is made reciprocal, before the causative element is added.

This leads to a structure such as (15a) for (14a), and not (15b):

(15)  a.  
     b.  

Only (15b) is directly compatible with the slot matrix approach.

(f) The slot matrix concept poses problems for the principle of adjacency in morphology, which departs from the idea that only the immediate context can determine the conditions under which an affix may be present or not (see Siegel 1977; Allen 1978). The adjacency principle has been extremely fruitful in recent morphological research.

A formal statement of the adjacency condition is given in (16):

(16) If the affixation of $a$ is dependent on the presence of $b$, where $b$ can be either an affix or a feature, then $b$ must be contained in the cycle adjacent to $a$.

To understand the implications for our argument, consider (17a, b, c):

(17)  a.  
     b.  
     c.  

In (17a) b is contained in the cycle adjacent to a and may condition the affixation of a; in (17b), however, there is an intervening cycle, the one containing c, and hence b may not condition the affixation of a; in (17c), finally, the flat tree structure implied by the slot matrix model, all elements are contained in the same cycle, and there is no way of stating which element may condition what.

(g) The interpretation of the slot matrix as a large rewriting rule with a number of positions (19 in schema [11]) to the right of the arrow goes against the ‘one rule, one affix’ principle, implicit in Aronoff’s (1976) formulation of word formation rules and current in much recent morphological writing.

For all these reasons, the slot matrix analysis of complex affix orders, at least for a language such as Quechua, creates as many problems as it solves. Its principal use is as a data presentation device, making it possible to discern the types of ordering present in a language. A beginning will be made in the next section toward analyzing these types of ordering in a more principled manner.

Toward an analysis

I hope to have shown the theoretical and descriptive difficulties that a slot matrix approach presents for Quechua data. What is the alternative? I think that no single alternative is available, but that in fact affix order, just like word order, results from a number of different components. In Figure 2 a very approximate sketch is given of the Cochabamba Quechua verbal affix system, once again in terms of the slot matrix approach. The affixes are categorized in various ways: first of all, curly brackets mark the empirical scope of the various explanatory principles given in the first section of the paper.

Principle (3), to recapitulate, marks the separation between inflection and derivation, which may be set at aspectual marker -sha-, or slightly to the left of it. It does not say anything about the different derivational or inflectional affixes. Principle (4) involves a subset of the affixes, namely those that seem to have a syntactic role as well. What class this is depends very much, of course, on one’s view of the morphology/syntax separation. At least one would think that principle (4) — affix order reflects the order of grammatical operations — would involve person, tense, reflexive and reciprocal, passive, causative, etc. The problem is that other affixes occur interspersed with this set, such as -raya- ‘fixedness’, -ri- ‘diminutive’, which are presumably not part of any syntactic or grammatical operation.

Principle (5), which claims that the order of the affixes is determined by
verbalizing suffixes
frequentative
to and fro
reciprocal
desiderative
fixedness
decisiveness
many objects
with force
diminutive action
causative/help

passive
cislocative/benefactive/reflexive
durative/progressive
first/second person object
tense/nominalizers
person subject
plural markers
potential mood
a cluster of independent affixes or cliticlike elements
their relevance to the meaning of the root, has been elaborated by Bybee (1985) and tested for a wide variety of languages. The result is the order of categories expressed in (18a):

(18) a. ROOT
valency
voice
aspect
tense
mood
number
person
gender

b. ROOT
valency (reciprocal, desiderative, causative)
voice (passive)
valency (reflexive, benefactive)
aspect (durative)
person
object
tense
number
person subject
mood

In (18b) we contrast the prediction made by Bybee with the approximate order found in Quechua. The contrast is made difficult by the fact that the first three elements listed in (18b) can vary in order in many ways, and that it is not clear what ‘aspect’ in Quechua may involve besides durative. Whatever the value of the contrast, it is clear that there is only a fairly rough correspondence.

Below we will return to principle (6), relating the position of an affix to its ‘scope’, in more detail. In general, it seems to be relevant to a derivational affix with an independent meaning, such as causative -chi-, or -ysi-, ‘to help someone accomplish X’. Principle (7), which stipulates the order of the element in a positive output filter, does not need to be discussed here, given its relation to the slot matrix approach.

The illustration of the various principles listed in the first section of this paper with Quechua data has shown their partial insufficiency to handle the data, the differences in scope between them, and also their partial overlap. A second way to think of the Quechua verbal affix order is indicated with dotted lines. They mark three ‘modes’ in the order of the affixes:

(19) a. The *lexical* mode, covering affixes which form intimate relations with the preceding root, often with idiosyncratic meanings, and which are fixed in their order.

b. The *syntactic* mode, involving affixes with a separate meaning and often with a variable order. The affixes in this mode are closest to syntactic elements, freely and recursively combinable.

c. The *inflectional* mode, implying a series of affixes fixed in their position and without a lexical meaning.
Summarizing their characteristics more systematically, we get (20):

<table>
<thead>
<tr>
<th>Order</th>
<th>Meaning</th>
<th>Number</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>lexical</td>
<td>fixed idiosyncratic</td>
<td>limited</td>
<td>internal</td>
</tr>
<tr>
<td>syntactic</td>
<td>variable independent</td>
<td>no limit</td>
<td>intermediary</td>
</tr>
<tr>
<td>inflectional</td>
<td>fixed no lexical</td>
<td>limited</td>
<td>external</td>
</tr>
</tbody>
</table>

These three modes are each characteristic of many morphological systems. Only rarely are they combined in this way, and Quechua dialects differ in the degree to which they participate in the three modes. The innovative, simplified system of Ecuador is predominantly characterized by the inflectional mode, while the traditional systems of central Peru (Ancash, Ayacucho) have a more extended lexical mode, in addition to the syntactic and the inflectional modes. Cochabamba Quechua (Bolivia), finally, is innovative, but not simplified, and appears to have a highly developed syntactic mode.

The classification of an affix as participating in the syntactic or inflectional mode is not simply a function of its interpretation. This can be easily demonstrated when we contrast -ku- ‘reflexive’ with -wa- ‘first person marking’ and -pu- ‘benefactive’. The reflexive marker can both precede and follow the causative marker, as we saw in (14). We would expect the same to hold for -wa- and -pu-, but (21) and (22) show that this is not the case (here BEN = benefactive, and lob = first person object):

(21) a. riku — chi — wa — n  
see CAU  lob  3  
‘He lets me see x’/‘he lets x see me.’

b. * riku — wa — chi — n  
see  lob  CAU  3

In fact, (21b) is ungrammatical, and the meaning that one would think is expressed by it is the second meaning of (21a).

(22) a. ruwa — chi — pu — n  
build CAU BEN  3  
‘For the benefit of y, he lets x build it.’

b. * ruwa — pu — chi — n  
build BEN CAU  3  
‘He lets x build it for the benefit of y.’

Here the meaning where the benefactive refers to the building rather than to the causing, (22b), is inexpressible without a paraphrase. At the same time, however, we would expect an affix such as -pu- to participate in the
syntactic mode given its independent meaning. There is no clear cutoff point.

Similarly, the inflectional affixes appear to share features of the lexical mode in that they combine sometimes to produce rather idiosyncratic meanings. This is particularly the case for the subject–object combinations that constitute a traditional puzzle for Quechua morphology. An example is (23):

(23) a. riku — wa — nki
    see 1ob 2
    ‘You see me.’

b. riku — wa — n
    see 1ob 3
    ‘He sees me.’

c. riku — nchis
    see 4
    ‘We (inclusive) see.’

d. riku — wa — nchis
    see 3–4
    ‘He sees us (inclusive).’

From (23a) and (23b) one would get the impression that -wa- is the first person object marker, and from (23c) that -nchis is the fourth (first plural inclusive) person subject marker. Hence (24d), combining the two and meaning ‘we (inclusive) see me’, should be ungrammatical. What we find, however, is that it is perfectly possible, but with an entirely different meaning. This type of idiosyncratic combination would seem to be much more characteristic of the lexical mode.

Supposing for the moment that this approach makes sense, how does the division into three modes link up with the earlier discussion in terms of five general principles? A first approximation of the possible connection is given in (24):

(24) lexical mode ----------------- — semantic relevance (5)
    syntactic mode  logical scope (6)
                   mirror principle (4)
                   derivation versus inflection (3)
    inflectional mode — positive filter (7)

The notion of semantic relevance is clearly pertinent to the idea that affixes that are involved in semantically idiosyncratic combinations with the root are the most internal ones. In an extended sense, as in the work of Bybee (1985), it is relevant as well to the syntactic mode, which is
governed by principles of scope and derivational order (in the same way as sentence syntax). One would think that the inflection/derivation distinction corresponds closely to that between the syntactic and the inflectional mode. The latter, finally, would appear to be governed in part by the type of positive filters discussed by Perlmutter (1974).

The most problematic aspect remains the syntactic mode, it would seem. We need a much more elaborate theory of the lexical entry, perhaps along the lines of Williams (1981), to help us to become much more explicit about intuitive notions such as 'scope', 'derivational order', and 'relevance'. Several subsystems are involved, each of which may be hierarchically organized:

(25) a. The TMA system:       b. The participant structure system:

<table>
<thead>
<tr>
<th>ROOT</th>
<th>aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>{tense}</td>
</tr>
<tr>
<td></td>
<td>{mood}</td>
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<table>
<thead>
<tr>
<th>ROOT</th>
<th>valency</th>
<th>voice</th>
<th>number</th>
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<td></td>
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<table>
<thead>
<tr>
<th>person</th>
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</table>

c. The Aktionsart system

Then we have to think about the relation between the subsystems, etc., and the extent to which these subsystems are part of the inflectional mode rather than of the syntactic mode.

If this paper has not yielded any definite conclusions, I hope it has helped to clarify some of the problems still ahead of us.

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Notes

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1. Here the following abbreviations are used:

<table>
<thead>
<tr>
<th>CAU</th>
<th>causative</th>
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<tbody>
<tr>
<td>REC</td>
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</tr>
<tr>
<td>REF</td>
<td>reflexive</td>
</tr>
<tr>
<td>PR</td>
<td>progressive</td>
</tr>
<tr>
<td>3</td>
<td>third person</td>
</tr>
<tr>
<td>PL</td>
<td>plural</td>
</tr>
<tr>
<td>IND</td>
<td>independent</td>
</tr>
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References