On the Formal Description of Inflection
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The study of morphology, or word formation, was in large part the foundation of traditional grammar. Syntax, when it was discussed, was generally treated as simply the applied branch of morphology: the study of the uses to which various word-forms could be put, and very definitely subordinated to the study of their formation. In the tradition of structural linguistics, too, morphology enjoyed pride of place over syntax, which was generally thought of simply as the extension of morphological principles to the formation of larger units.

In generative grammatical studies, however, morphology has until recently been subject to a sort of erosion from both sides. On the one hand, the principles by which morphemes can be combined into larger units has seemed to many to be a natural subset of syntax. Generative semantics, in particular, has tended to treat the study of word structure as simply a special case of sentence structure, a move which curiously inverts the structuralist assimilation of these fields. On the other hand, much of the variation in shape which morphological elements are subject to, formerly the business of rules of 'allomorphy' and otherwise clearly considered morphological has come to be treated in phonological terms, as it has been seen how a relaxation of the strong constraints of a surface-oriented phonology can lead to greater generalization. Increasingly it seemed possible to reduce morphological elements in general to single shapes, with all variation conditioned by phonological rules. Insofar as both this reduction and the reduction of word structure to sentence structure were carried out, it is clear that there was very little need for an independent notion of morphology.

In recent years, however, both of these directions have been reversed. In syntax, the trend toward lexicalism and variants thereof has increasingly emphasized the syntactic autonomy of morphologically complex lexical items, leaving their internal structure to be described elsewhere; while in phonology the rejection of highly abstract underlying forms and derivations has resulted in the recognition that much variation in phonological shape is conditioned, as our predecessors told us, by morphological rather than phonological factors. The result is that as these waters have receded, a distinct continent of morphology has re-appeared to the wondering eyes of grammarians.

In European studies such as those of Bierwisch (1967), Kiefer (1970, 1973), Linell (1972), and the aptly entitled Wurzel (1970, 1975) this resurgence has been motivated largely by the problem of describing systems of inflection and their relation to phonology. American studies such as those of Aronoff (1976), Halle (1973), and Jackendoff (1975), on the other hand, have been based largely on a concern for the relations between derivation and syntactic structure. Both groups have also based their claims largely on languages such as English, French, German, Russian, and Swedish in which the degree of formal
It is quite clear that these languages are much simpler in formal terms than those treated in a series of studies by Mathews (1967, 1972a, 1972b, 1974). Mathews shows that in principle the devices which must be provided by a morphological theory of general applicability are rather richer than a consideration of the better-known European languages might suggest, and that certain fundamental assumptions of much work, especially in America, are ultimately untenable.

Mathews' work is primarily based on the study of inflection, as opposed to derivation. One might well propose that these two sorts of morphology are actually quite different, and that conclusions drawn on the basis of inflectional systems are necessarily applicable to the study of morphology as a whole. This objection is probably not to be taken too seriously, however. Insofar as the distinction between inflection and derivation is a substantive one, there is little reason to believe that it rests on the formal character of the word formation processes involved, in the sense of overt relations between the forms involved. On the one hand, this distinction is notoriously hard to draw in a motivated way on any basis, and both inflection and derivation seem to make use of affixation, replacements, deletions, reduplication, etc.; while on the other hand, it is fairly common for a process to switch from one type to the other without altering its formal character at all, but only its syntactic or lexical status and perhaps its productivity. It seems clear, then, that inflection and derivation share a substantial formal core.

The intention of this paper is to examine some of the properties of the system of morphological rules in a complete grammar. Our discussion below will be based primarily on the consideration of a fairly complex inflectional system, that of Potawatomi, from which a number of interesting properties can be deduced. The rules of the morphology of this language seem to be of fairly straightforward and well motivated form, and suggest a framework within which a number of further problems can be usefully raised.

Most work in generative phonology has assumed that the task of the morphology, insofar as this is a distinct field, is to construct a representation to serve as input to the phonology proper. This representation, as Lounsbury (1953) observed, has a 'pseudo-agglutinative' character, consisting of a string of morphemes joined by boundaries of various sorts. Each morpheme is presumed to be a sort of minimal Saussurean sign: the unity of a set of morphological properties ('accusative singular', 'aorist', 'third person inanimate', etc.) with an aspect of the form of the resultant word, preferably with an isolable chunk of phonetic material (an affix or root). This model of underlying representation is actually quite close to the item-and-arrangement model of American structuralism, differing primarily in its more abstract relationship to surface phonetic form and in the sorts of information that are allowed as relevant in its establishment.

This model suffers from two sorts of defect, however. On the one hand, the assumption that the morphology constructs a representation for the phonology to work on, much as the base component constructs a representation that serves as input to the syntax can be shown to be false by examples demonstrating that phonological and morphological processes can, in the general case, be interleaved. Even though such interactions are the exception, rather than the rule, the fact that they occur shows that the notion of a separable morphological 'component' is probably untenable, at least in the form of a claim about the relative ordering of phonological and morphological processes. This issue is discussed to some extent in Anderson (1975), and will not be our major concern here.

Another defect of this model, however, has a more direct effect in motivating the form of the rules of the morphology. If this model were correct, that is, we might imagine that the morphology consists of approximately a set of phrase-structure-like tactic rules, which define the permitted sequences of morphemes; and a set of substitution rules which provide phonological realizations of the morphemes. In general, the model suggests that morphemes are largely independent of one another to the extent that the realization rules ought to be able to apply simultaneously.

Inflectional systems of even moderate complexity make it clear, however, that the one-to-one association of clusters of morphological properties with chunks of phonetic material presumed by this notion of the morpheme does not in general hold. For a comparatively simple example of this, consider the Old English verb form *bēor* "(he) bore". There are two formal aspects to the inflection of this form of the verb: the ending, the quality of the vowel, and the quality of the vowel. The morphological categories corresponding to these formal features are the following: 3rd person, singular, preterite, indicative. Let us consider what the associations are between the two groups of facts.

Consider first the *θ* ending. This is associated with 3rd person (cf. *bēor* "you (sg) bore"), singular (cf. *bōron* "they bore"), preterite (cf. *bērphp* "he bears") and indicative (cf. *bēor* "(that) he bore"). Thus, all four morphological categories are relevant to determining the shape of the ending of this form. On the other hand, consider the root vowel quality. This is associated with person (cf. *bēor* "you (sg) bore"), number (cf. *bōron* "they bore"), tense (cf. *bērphp* "he bears") and mood (cf. *bēor* "(that) he bore"). Again, all four categories are relevant to this single feature of the form. Thus, instead of a one-to-one relation between aspects of form and clusters of morphological properties, we see that the association is actually many-to-many.

This sort of fact, reviewed in greater detail by Mathews in the works cited above and also exemplified below in Potawatomi, suggests a different conception of the principles by which morphological factors influence the form of a word. Instead of the item-and-arrangement structure often assumed (even if covertly) by representations that associate formats of phonological material with 'glosses' of morphological properties, we might assume a more process-oriented description similar to the 'word-and-paradigm' framework proposed by Mathews. Let us assume, that is, that the morphological rules operate as follows. Such a rule has access through its structural description to a pair of representations: on the one hand, to the phonological form as constructed by previous rules (initially, perhaps to a root or stem inserted directly from the lexicon), and on the
other to a complex symbol consisting of the entire set of morphological properties realized by the form. Instead of performing a simple substitution of phonological material for morphological categories, such a rule can perform any one of a number of formal operations on the phonological form (including the addition of an affix, reduplication, substitutions such as those of ablaut systems, etc.) on the basis of any subset of the morphological categories present.

As a result, the general properties of inflectional systems will be captured naturally. A single property may be relevant to a number of rules, and on the other hand a single rule may make reference to a number of distinct properties, perhaps overlapping with those referred to by other rules. Since the set of properties referred to by a rule may be a disjunction, it is no longer necessary to assign a unique categorial label to a given formative, which may be introduced as a result of the presence of any one of several (perhaps mutually incompa-
tible) categories. "Parasitic" derivations, in which a form appears to be derived from another form inflected for properties it does not contain (as for example, the usual description of French adverbs in -ment as derived from feminine adjective forms) is easily provided for.

A number of other complexities that vexed early writers on the topic of the nature of the morpheme also dissolve on this view.

The set of (simultaneously applied) substitution rules which provide phonological realization for morphological categories on the item-and-arrangement view, then, are replaced by this more general sort of operation. The phonological nature of the structural changes of such rules suggest that indeed all morphologically conditioned processes can be formulated in such terms, and we will refer to such rules as morphological. The other class of processes posited in the item-and-arrangement model, however, do not correspond directly to distinct rules on this view. Part of the function of the 'tactic' rules is performed by the rules of the syntax (case-marking, agreement, etc.) or by constraints on lexical representation; while the relative ordering of formatives in the form is determined by the relative ordering of the morphological rules themselves. If suffix A precedes suffix B in a given language, that is, then in the general case the rule introducing suffix A applies before the rule introducing B. Various properties of the interaction of morphological rules will be examined below.

In terms of this model, then, we will now examine a part of the morphology of inflection in the Algonquian language Potawatomi. Our discussion will be limited to the forms of nouns, possessed and -unpossessed, and to the independent indicative affirmative forms of verbs. A number of other verbal categories exist in the language, and our account could in principle be extended to them, but since such principles appear to be involved in such an extension, this (fairly substantial) domain will suffice for our purposes.

The categories for which words are inflected in Potawatomi are as follows. Nouns belong to one of two genders, animate or inanimate (based roughly, but not precisely, on natural semantic considerations). They may further be distinguished as obviative or proximate: roughly, an obviative noun (phrase) is one referring to a participant in the situation referred to who is less central to it than another third person.

Non-obviative nouns may further be marked as singular or plural.

Verbs are divided into four main classes. Inanimate intransitive verbs are those not taking a formal object, and whose subject must be an inanimate NP; animate intransitive verbs require an animate NP for their subject. Transitive inanimate verbs, on the other hand, take both a subject and an object, and the latter must be inanimate; while transitive animate verbs require their object to be animate. Transitive verbs do not place any restrictions on the gender of their subjects.Animate and inanimate verbs sometimes come in morphologically related pairs (e.g., /wapum/ "see (TA)" vs. /waput/ "see (TI)"), but in some cases the relationship is completely suppositive or indeed one of the pair does not exist. Verbs are marked for the person-number (first, second, third, or obviative singular; first person inclusive, first person exclusive, second person, or third person plural) of their subject and (if transitive) object, in complex ways to be discussed below. Other categories of verbal inflection fall outside the scope of this study. In addition to their own basic properties, nouns can be inflected for the person and number of their possessor, and pronouns exist for the various person-number combinations as well. Some restrictions of a syntactic nature limit the distribution of obviatives: thus, a possessed noun may be obviative, and its possessor proximate, but not vice-versa; and a TI verb may have proximate subject and obviative object, but not vice-versa.

Relevant morphophonemic rules of the language include the following. A number of processes depend on the distinction between weak vowels (orthographic y, phonetically [ɔ], and o) as opposed to strong vowels (e.g., and other instances of o). The difference between weak and strong o corresponds to the etymological distinction of length, but has no phonetic reflex in the modern language. Since we are not concerned here with phonology directly, we will not in general distinguish the two sorts of o; nor will we distinguish the few instances of a strong y from the normal, weak vowel. Details can be found in Hockett (1948). The rules involved are these: when two consonants come together at a morpheme boundary, a y is inserted. A y vowel is lost immediately adjacent to another vowel; an o is lost if weak when adjacent to a strong vowel. When both vowels in a bisyllabic word are weak, the first is lost (thus, /uku/ becomes [kul] "land"). Final weak vowels are lost. After this, within every sequence of consecutive syllables containing weak vowels, the odd-numbered ones (first, third, etc.) are lost, unless they are in the final syllable. This rule results in radical alterations in the surface shape of forms depending on the addition of prefix syllables. Finally, the glides /w/ and /y/ are replaced by [ʔ] before /w, o/ and /y, i/, respectively. A number of other phonological processes can be described, but these (especially the rules of weak vowel insertion at boundary and weak vowel loss) are the most important for an understanding of the inflectional system.
Animate nouns, on the other hand, have distinct inflections for plural and for obviative:

(2) /wapos/ "rabbit": sg. wapos
pl. waposok
obv. waposon

To account for the facts of (1) and (2), we need two morphological rules: one to add /k/ to animate plurals, and one to add /n/ to inanimate plurals and to obviatives. Anticipating later rules, we observe that the nouns which are subject to this inflection are neither first nor second person stems, and formulate the rules as (3):

(3) a. 

\[\begin{align*}
\text{[+me]} \\
\text{[-you]} \\
\text{[+anima]} \\
\text{[+plur]} \\
\end{align*}\]

\[\rightarrow\] \(X+k\)

b. 

\[\begin{align*}
\text{[+me]} \\
\text{[-you]} \\
\text{[+plur]} \\
\text{[+obv]} \\
\end{align*}\]

\[\rightarrow\] \(X+n\)

Observe that, although both the complex of features specifying morphological categories and the phonological form are present in the structural description of this rule, only the phonological form undergoes a change.

One further point remains to be made about these rules. Recall that obviative nouns are not separately inflected for plurality: i.e., the plural and obviative endings are mutually exclusive. As we have written rule (3b), however, this is not explicit; indeed, it would appear that any animate plural, whether obviative or not, ought to undergo both suffixation processes. We could capture the facts by requiring that a plural form be [+animate] in order to undergo rule (3b), but as we will see below, such explicit provision for the relation of mutual exclusiveness observed would make unfortunate predictions which we would like to avoid. Instead, we will assume that rules (3a,b) form a disjunctively ordered block of rules, and that their interaction is governed by a principle similar to the disjunction condition of Chomsky and Halle (1968): when a block of rules is disjunctively ordered, they are applied by trying the first rule in the block first. If that applies, the remainder of the block is skipped; otherwise, the next rule in sequence is tried in the same way, until the entire list has been examined. We will in general assume that relations of mutual exclusivity of morphological processes are to be captured through disjunctive ordering within such blocks, and will discuss this further below. For now, it should be noted that (unlike the principles of disjunctive order specified for phonological rules by Chomsky and Halle, 1968, and Anderson, 1974) there is no formal property of these rules that tells us they should be disjunctive. We assume that disjunctiveness between rules is a

potentially idiosyncratic property of particular grammars, just like the relative sequence of rules. We will see below that interesting properties of morphological systems follow from this proposal.

Let us now consider the paradigms of some possessed nouns. We will take first the inflection of a possessed inanimate:

(4) /dim/ "canoe"

<table>
<thead>
<tr>
<th>Possessor</th>
<th>3sg</th>
<th>3pl</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg</td>
<td>nčim (um)</td>
<td>nčim (mu)</td>
</tr>
<tr>
<td>2sg</td>
<td>kčim (um)</td>
<td>kčim (mu)</td>
</tr>
<tr>
<td>3sg</td>
<td>wčim (um)</td>
<td>wčim (mu)</td>
</tr>
<tr>
<td>12</td>
<td>kčim (mu)nan</td>
<td>kčim (mu)nan</td>
</tr>
<tr>
<td>13</td>
<td>nčim (mu)nan</td>
<td>nčim (mu)nan</td>
</tr>
<tr>
<td>2pl</td>
<td>kčim (mu)wa</td>
<td>kčim (mu)wan</td>
</tr>
<tr>
<td>3pl</td>
<td>wčim (mu)wa</td>
<td>wčim (mu)wan</td>
</tr>
</tbody>
</table>

There are a number of aspects of this paradigm which require description. Note first the optional element \(-u(m(u)-)/. The vowels in this form can be produced by epanthesis as described above, and where they do not appear, this is due to weak vowel loss; the element in question is simply \(-u/- phonologically. This formative appears in some possessed nouns and not in others. A substantial number of nouns (including most body part and relationship terms, as well as some others) are called dependent, in that these only appear in possessed form. Dependent nouns never show the /m/ in question. Other nouns may optionally have \(-a/-, apparently as a lexical idiosyncracy. We will assume that there is some lexical feature \([+M]\) which distinguishes those that do from those that don't take /m/; this is of course totally ad hoc, but that seems to be precisely the character of the facts concerned. We will assume, then, that the grammar contains a rule to add /m/ to nouns marked \([+M]\) when they are possessed.

But before we can write such a rule, we must ask how possessed nouns are to be represented in terms of complex symbols. The paradigm in (4) shows clearly that we must mark the noun both for its own features (i.e., \([+\text{plural}]\) and also for the features of its possessor. Furthermore, comparing wčimanum "his canoes" with wčimawan "their canoe", it is clear that we must keep the features for these two distinct: it will not do, that is, to simply add the features for the possessor to those for the possessed noun.

One solution would, of course, be to posit additional features such as \([+\text{1st person possessor}]\), \([+\text{plural possessor}]\), etc., but this would be of little interest. Further, we will see that this solution would not generalize to the rest of the inflectional system in the way we would like it to. Let us then make the following proposal: when a rule of the grammar assigns features to an element, and that element already carries specifications for those features, then (unless of course the rule is explicitly stated so as to change the features involved, rather than simply to add them) the result is not that the new features and the old merge within the same complex, but rather that a new layer of structure is created, taking the old feature
complex as its 'base'. The result of applying a rule assigning the value \(+F\) to the feature complex in (5a), that is, is the complex symbol (5b):

\[
\begin{array}{c}
\text{(5a) } [-F] \\
\text{(5b) } \begin{cases}
[-F] \\
[-G] \\
+F \\
+F
\end{cases}
\end{array}
\]

In the rules below, we will often write an element such as (5b) as (5b') instead, but it should be noted that the apparent ordering involved in this representation is not significant; only the hierarchical structure of the representation matters. From now on we will refer to the feature complexes involved in morphological rules and representations as morphosyntactic representations.

We now have a way to refer to the fact that a noun is possessed: this is true just in case its morphosyntactic representation is complex. We can thus write the rule for possessed noun themes in /n/ as:

\[
\begin{array}{c}
\text{(6) } [N, +m] \\
\text{//X/} \quad \longrightarrow \quad /X+n/
\end{array}
\]

Note that we assume also that morphosyntactic representations are labeled bracketings of feature complexes.

We have now provided a mechanism for deriving the themes of possessed nouns, where these are distinct from the bare noun stem. Let us now consider the possessor markings. Observe that this can be divided into two parts: a set of three prefixes, and a set of two suffixes. Consider first the prefixes. We can see immediately that the prefix /-k-/ appears whenever the possessor includes the second person: 2sg, 2pl, and 12 (= 1st person inclusive plural). The prefix /-n-/ appears whenever the first person but not the second is included in the possessor: 1sg, and 13 (= 1st person exclusive plural). When neither the first nor the second person is included, we find the prefix /-w-/. Clearly this set of three prefixes, since they are mutually exclusive, should be described by a disjunctively ordered block of rules such as (7):

\[
\begin{array}{c}
\text{(7a) } [+you [ ]] \\
\text{//X/} \quad \longrightarrow \quad /k+X/
\end{array}
\]

\[
\begin{array}{c}
\text{(7b) } [+me [ ]] \\
\text{//X/} \quad \longrightarrow \quad /n+X/
\end{array}
\]

\[
\begin{array}{c}
\text{(7c) } [ ] \\
\text{//X/} \quad \longrightarrow \quad /w+X/
\end{array}
\]

The disjunctive relation among these rules describes the hierarchy of person marking: in particular, the fact that forms with 12 possessor are prefixed with /-k-/ rather than with /-n-/. Similarly, rule (7c) is formulated as an 'elsewhere' case, applicable only to possessed noun complexes in which neither (7a) nor (7b) has applied.

The only feature of the paradigm in (4) remaining to be described, then, is the set of suffixes. We can see that /-wa/ and /-w-n/ appear when the possessor of the noun is plural: when it includes a first person (12 or 13) we get /-n-n/, and when it does not, we get /-w-wa/.

Again, this pair of suffixes is mutually exclusive, and so the rules must be disjunctively ordered:

\[
\begin{array}{c}
\text{(8a) } [+me [-N]] \\
\text{//X/} \quad \longrightarrow \quad /w+n/
\end{array}
\]

\[
\begin{array}{c}
\text{(8b) } [+plur [-N]] \\
\text{//X/} \quad \longrightarrow \quad /w+wa/
\end{array}
\]

The last morphological element in the paradigm (4), the /-n/ suffix which characterizes plural possessed nouns, is of course the same as the one introduced by rule (3b) above. Note that we only want (3b) to apply when it is the possessed noun, not the possessor that is plural. In order to assure that result, let us establish the following convention about the analysis of morphosyntactic representations by the structural description of a morpholexical rule: when a rule refers to a feature in such a representation, only the innermost layer of structure in the representation may be analyzed unless the structural description explicitly specifies another layer of structure.

We now have all of the apparatus necessary to derive the paradigm in (4). We can observe that the ordering of affixes gives us the following order of rules: rule 6 (thematic m) must precede rule 8 (plural possessor marking), which must in turn precede rule 3 (pl. and obviative marking). Assuming a syntactic rule of possessor agreement, we can illustrate the working of the system with the following derivation of 'our canoes':

(9) syntactic representation:

\[
\begin{array}{c}
\text{possessor agreement:} \\
\text{rule (6)} \\
\text{phonology:}
\end{array}
\]

\[
\begin{array}{c}
\text{[+me [-N]]} \\
\text{[+plur [-N]]} \\
\text{[n-w+n-n-n/]
\end{array}
\]

\[
\begin{array}{c}
\text{[n-Ximanunununun]}
\end{array}
\]
Let us now consider the paradigm of a possessed animate noun:

(10) /okuma/ "chief"

<table>
<thead>
<tr>
<th>possessed</th>
<th>3sg</th>
<th>3pl</th>
<th>obviative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg</td>
<td>ntokkam</td>
<td>ntokkamuk</td>
<td>ntokkamun</td>
</tr>
<tr>
<td>2sg</td>
<td>tukkam</td>
<td>tukkamuk</td>
<td>tukkamun</td>
</tr>
<tr>
<td>3sg</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>tukkamuk</td>
<td>tukkamuk</td>
<td>tukkamun</td>
</tr>
<tr>
<td>13</td>
<td>ntokkam</td>
<td>ntokkamuk</td>
<td>ntokkamun</td>
</tr>
<tr>
<td>2pl</td>
<td>tukkamwak</td>
<td>tukkamwak</td>
<td>tukkamwun</td>
</tr>
<tr>
<td>3pl</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The forms for 3sg, 3pl possessor of 3sg, 3pl possessed are missing, of course, because in these circumstances the possessor is obligatorily put into the obviative.

Evidently, the paradigm in (10) can be almost completely derived by means of the rules already established. The /-k/ and /-n/ endings of the second and third columns are due to rule (3); the prefixes are due to rule (7); thematic m is introduced by rule (6), and the suffixes for plural possessor by rule (8). The only feature of this paradigm not yet accounted for is the intrusive /t/ between the prefix and the stem. This element is not in fact unique to animates; rather, it appears in all possessed noun formations when the stem begins with a weak vowel (as is the case here), and optionally when the stem begins with a consonant (Rockeyt, 1948:69). We can formulate the rule which introduces this t-augment as follows:

(11) [[m]]

Ob1: /o,u]/X/
Opt: /C X/

1 2 --->$t+1 2$

Rule (11) must apply before rule (7). For obvious reasons, we have not been able to establish any particular ordering between the rules which introduce prefixes (11,7) and those which introduce suffixes (6,8,3), although the ordering within each of these sets is fixed.

We have now dealt with the nominal paradigms, with one exception. We give below the set of independent pronouns of Potawatomi:

(12) 1sg nin 12 kinan 13 ninan
      2sg kin 2pl kinwa
      3sg win 3pl winwa

The similarity of these forms to the paradigm of a possessed noun leads us to consider them structurally as possessive formations, whose stem is /in/ alternating with simply /i/ before the suffix /-m/.

With the exception of that irregularity of stem, for which we do not formulate a rule, the paradigm (12) can be derived by the rules we have established above. Independent pronouns only occur in positions of emphasis, and the stem /in/ can plausibly be treated as something like "self".

We now turn to the inflectional paradigms of Potawatomi verbs. The inanimate intransitive class is particularly simple:

(13) /wawuye/ "to be round" 3sg. wawuye 3pl. wawyeaton
     obv. wawyeayun

Since first and second person participants are always animate, only third person forms exist; the obviative is marginal, but apparently exists. We can note immediately that both the plural and obviative forms end in /-n/; since rule (3b) above refers to just these features as the conditions for the insertion of final /-n/, we can make use of it in this paradigm as well as the noun paradigms which provided its original motivation. Thus we see that the formulation in (3), which is not limited to nouns, was correct.

In addition to the effects of rule (3b), however, there are two additional formatives in the inanimate intransitive paradigm which remain to be accounted for. These are the stem extensions /-to/ and /-n/.

(14) a. [[-anim]]
    /-plur
    /
    /X/ $\implies$ /X+to/

b. [[-anim]]
    /+obv
    /
    /X/ $\implies$ /X+n/

The rules in (14) apply only to verbs. They must be ordered before rule (3).

Let us now consider the paradigm of an animate intransitive verb:

(15) /kas:ukum/ "to start running"

1sg nkask:umi
2sg kkask:umi
3sg kask:umi
obv kask:umin
12 kkask:umimu
13 nkask:umimu
2pl kkask:umim
3pl kask:umik

Comparing this paradigm with those of the noun forms we have dealt with above, we find both similarities and differences. Consider first the prefixes. Note that the /k/-prefix for second person, and the /n/-prefix for first person, have a distribution like that produced by the operation of rules (7a,b) above. As those rules were originally formulated, however, they applied only in complex (two-layered) morphosyntactic representations. Subject to confirmation from subsequent verb types, we can suggest that these rules should be applicable to verbs as well as to the nouns which originally motivated them; in addition, we see that we must generalize them to apply to one-layer morphosyntactic representations containing the appropriate features.

Since there are no nouns that are either [+me] or [+you] (recall that
independent pronouns are structurally possessive constructions, this
move cannot cause any trouble for the paradigms already considered.
Accordingly, we make use of the usual convention from phonology of
parentheses to enclose optional material, and reformulate (7a,b):

(16) a. [+you {()}]
   \(X/ \rightarrow /k+X/\)
b. [+me {()}]
   \(X/ \rightarrow /n+X/\)

Observing the forms with only third person participants in (15), we
see that the analog of rule (7c), which would insert \(/w=/\, should not
apply here. We therefore leave that rule as originally formulated,
so that it only applies to complex structures.

Moving on to the suffixes, we find first an element \(/-mun/\,
aologous to the \(/-nan/\ introduced by rule (8a) in marking the presence
of a first person plural (inclusive or exclusive); and an element
\(/-m/\ which similarly marks second person plural. We can provide for
these by the following rules:

(17) a. [+me \[{+plur/\}]
   \(X/ \rightarrow /X+mun/\)
b. [+you \[{+plur/\}]
   \(X/ \rightarrow /X+m/\)

If these rules are applied disjunctively, that will account for the
fact that 12 forms are marked with \(/-mun/\ and not with \(/-m/\ also.
The only remaining material in the paradigm in (15) are the
elements \(/-k/\ in the 3pl form and \(/-a/\ in the obv. form. These are,
of course, the same as those introduced by rules (3a,b) above, and we
presume that those rules operate in this paradigm as well.

We move on now to the paradigm of a transitive inanimate verb:

(18) /wpuit/ "to see (it)"

<table>
<thead>
<tr>
<th>3sg object</th>
<th>3pl object</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg nwaptan</td>
<td>nwaptanun</td>
</tr>
<tr>
<td>2sg kwaptan</td>
<td>kwaptanun</td>
</tr>
<tr>
<td>3sg *wpaptun</td>
<td>*wpaptun</td>
</tr>
<tr>
<td>12 kwaptunun</td>
<td>kwaptunun</td>
</tr>
<tr>
<td>13 nwaptanun</td>
<td>nwaptanun</td>
</tr>
<tr>
<td>2pl kwaptanawa</td>
<td>kwaptanawa</td>
</tr>
<tr>
<td>3pl *wpaptunawa</td>
<td>*wpaptunawa</td>
</tr>
</tbody>
</table>

Recalling that the initial \(7\) of the third person forms in (18) re-
prents morphophonemic \(/w/\ due to the initial \(/w/\ of the stem; with
other stem types, this element shows up overtly as \(/w/\), it is obvious
that this paradigm has a good deal in common with that in (4) above
for possessed inanimate nouns. In particular, the marking for the
plurality of the object is similar to that in (4) for plural possessed;
while the rest of the paradigm marks the features of the subject in

a way similar to that employed for possessors in (4). Clearly we would
like the morphosyntactic representations of transitive verbs to resemble
those of possessive constructions.

Consider the way the process of agreement must work in Potawatomi.
This rule (or rules) must copy the person and number features (includ-
ing obviation status) of the subject and object noun phrases onto the
verb. While verbs have selection restrictions for animacy of their
subject (if intransitive) or object (if transitive), they are not
intrinsicly specified in any way for person and number. Let us assume,
then, that the morphosyntactic representation of a verb is initially
simply (19), as far as the details of interest to us are concerned:

(19) a. [+anim] \(X/ \rightarrow /X/\)
b. [−anim] \(X/ \rightarrow /X/\)

The choice between (19a) and (19b), of course, depends on the verb
class.

The agreement rules, we will suggest, then simply copy person
and number features onto the verb. Consider first an intransitive
verb. Its morphosyntactic representation is initially one of (19),
and thus unspecified for these features; when subject agreement (the
only applicable rule) applies to such a verb, the features for the
person and number of its subject will simply be added to the feature
for animacy, creating a representation like that of a simple noun
except for the label on the bracketing.

In the case of a transitive verb, however, we must copy features
for both subject and object, and must furthermore keep them distinct.
Again, we could posit a set of features like \([+3sg\ object], [+\ plural
subject], etc; but the similarity between the transitive verb paradigms
and those for possessed nouns suggests a more appropriate move. Note
that, apparently, the object noun in a transitive construction cor-
responds to the head (possessed noun) in a possessive construction.
Therefore, we want the feature for the object noun to occupy the
innermost layer of the verb's morphosyntactic representation. Let
us apply object agreement first, then, copying the features for person,
number, and obviation onto the verb. Since the verb is initially un-
specified for these features (just as with the intransitive case con-
sidered above), they will simply be added to the complex symbol.

When now we apply subject agreement, however, the case will be
different. Just as in the case of a possessive construction, when we
attempt to copy the features for person and number of the subject of
a transitive verb, we will find the representation of the verb is al-
ready specified for those features (due to the prior application of
object agreement), and thus the same convention that was relevant for
possessed nouns will come into play: an additional, outer layer of
structure will be created for the features of the subject. As a result,
transitive verbs and possessed nouns will have structurally similar
morphosyntactic representations, as desired.

We may note parenthetically that languages of the Algonquian
family (of which Potawatomi is in this respect entirely typical) have
sometimes been claimed to be ergative, on the basis of the fact
that their verbs place selectional restrictions in regard to animacy
on the subjects of intransitives or the objects of transitives (the
plural subjects have undergone either rule (21), introducing /mun/, or rule (23), introducing /wa/. Further, these rules must be ordered disjunctively if they are to be stated in maximally general form as above. We can therefore introduce the /n/ of the singular subject forms by a rule which is disjunctive with respect to both (21) and (23), and which applies after them:

\[(24) \quad [[v_{animate}]]
\]

\[/X/ \longrightarrow /X+m/n/\]

We can observe that this rule is much like rule (16b), which introduced a formative /n/ in intransitive inanimate verbs with obviative objects: if we had some reason to believe that inanimate objects of verbs with singular subjects were always treated as structurally obviative, we could dispense with rule (24) entirely in favor of (14b), but since inanimate object of verbs with plural subjects do not appear to be treated as obviative, this does not seem appealing.

Moving on to the 3pl forms of the inanimate transitive paradigm in (18), we see that the ending /-n/ which distinguishes these from the 3sg object forms is just what we would expect, given rule (3b). The only feature we do not expect is the fact that no final /-n/ appears in the forms with 12 and 13 subjects. In fact, as we will see below when we consider the animate transitive paradigm, the ending /-k/ for animate plurals also fails to occur in similar forms. It appears simply to be the case that forms ending in the suffix /mun/ do not take either of these further endings: in other words, that the rule introducing /-mun/ is disjunctive with respect to the rules (3a,b) introducing /-k/ and /-n/. Unfortunately, we have no natural way to represent this fact: the rule introducing /-mun/ is disjunctive with respect to the rule introducing /-wa/, and while the former is apparently disjunctive with respect to the /-k/ and /-n/ rules, the latter is not (cf. kwaptanawan "you (pl) see them"). If we represent disjunction in terms of grouping rules together into schemata, this set of relations cannot be treated in that way. We see no other alternative at present than to simply state, by brute force, that forms ending in /-mun/ take no final suffix. This can be done by having a \(\phi\)-suffix rule which is disjunctive with respect to the /-k/ and /-n/ rules:

\[(25) \quad /X+m/n/ \longrightarrow /X+m+n/\]

Presumably such rules for \(\phi\)-suffixation are necessary in grammars in some cases, but we cannot claim to feel particularly happy about this one, which simply serves to avoid the claim that arbitrary pairs of (possibly non-adjacent) rules are disjunctively ordered.

At this point, we have dealt with all of the noun paradigms (possessed, unpossessed, and pronouns), and verb paradigms from three of the four classes of verbs. The remaining class of verbs, the transitive animate forms, are by far the most complex, but we will see that much of the apparatus developed thus far will come into play in their treatment. These forms can be grouped into three sets, depending on the relations obtaining between the subject and object. The most straightforward forms to describe are those in which the object is a third person singular, plural, or obviative form, and the subject is first, second, or third (non-obviative) person:
(26) /wapum/ "to see (him)"

<table>
<thead>
<tr>
<th>3sg object</th>
<th>3pl object</th>
<th>obv object</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg nwapmuk</td>
<td>nwapmukok</td>
<td>nwapman</td>
</tr>
<tr>
<td>2sg kwapmuk</td>
<td>kwapmukok</td>
<td>kwapman</td>
</tr>
<tr>
<td>3sg ---</td>
<td>---</td>
<td>kwapman</td>
</tr>
<tr>
<td>12 kwapmanuk</td>
<td>kwapmanukanuk</td>
<td>kwapman</td>
</tr>
<tr>
<td>13 nwapmanuk</td>
<td>nwapmanukanuk</td>
<td>kwapman</td>
</tr>
<tr>
<td>2pl kwapmanuka</td>
<td>kwapmanuka</td>
<td>kwapman</td>
</tr>
<tr>
<td>3pl ---</td>
<td>---</td>
<td>kwapman</td>
</tr>
</tbody>
</table>

These forms, referred to as the direct forms of the TA paradigm, can be entirely accounted for in terms of the rules developed above. Consider first the prefixes. The elements /k/-, /n/-, and [ʔ-] (=w/) are taken care of by rules (16a), (16b), and (17c) respectively without any modification. The first post-stem suffix element, /a/, is introduced by rule (20), which also introduced such a theme-formative in the TI paradigm. The elements /-mum/ and /-wa/, marking first person and non-first person plural subject, respectively, are those introduced by rules (21) and (23). The /-k/ suffix for animate plural object, and the /-n/ suffix for obviative object, are those introduced by rules (3a) and (3b). As in the case of the TI paradigm, these suffixes do not appear after the suffix /-mum/; rule (23) has the effect of blocking their application. The entire paradigm (26), then, can be treated without any further additions to the grammar.

Now let us turn to the forms of the TA verb in which the subject is third person and the object first or second; or where the subject is obviative and the object proximate. For syntactic reasons, obviative subjects do not appear (as distinct from proximate) where the object is non-third person.

(27) /wapum/ "to see (him)"

<table>
<thead>
<tr>
<th>(object)</th>
<th>3sg subject</th>
<th>3pl subject</th>
<th>obv subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg nwapmuk</td>
<td>nwapmukok</td>
<td>nwapman</td>
<td></td>
</tr>
<tr>
<td>2sg kwapmuk</td>
<td>kwapmukok</td>
<td>kwapman</td>
<td></td>
</tr>
<tr>
<td>3sg ---</td>
<td>---</td>
<td>kwapman</td>
<td></td>
</tr>
<tr>
<td>12 kwapmanuk</td>
<td>kwapmanukanuk</td>
<td>kwapman</td>
<td></td>
</tr>
<tr>
<td>13 nwapmanuk</td>
<td>nwapmanukanuk</td>
<td>kwapman</td>
<td></td>
</tr>
<tr>
<td>2pl kwapmanuka</td>
<td>kwapmanuka</td>
<td>kwapman</td>
<td></td>
</tr>
<tr>
<td>3pl ---</td>
<td>---</td>
<td>kwapman</td>
<td></td>
</tr>
</tbody>
</table>

The similarity in organization between the paradigm of direct forms in (26) and the above paradigm of inverse forms is hardly accidental. It is clear that what marks the difference between the two sets of forms (aside from the stem-forming element /uko/ and some other minor points) is the fact that the morphology which indicates the person and number of the subject in (26) is employed to mark the object in (27), and vice versa.

There are a variety of ways this paradigm could be accounted for. Disregarding completely 'brute force' approaches, which would treat (27) in complete isolation from the other paradigms considered up to this point, it would appear that we wish the morphosyntactic representations of the inverse forms to differ systematically from those of the direct forms precisely in that the innermost layer of structure in the inverse forms corresponds to the subject, rather than to the object. Given the view of agreement, etc. which we sketched above, this is not of course what we would expect.

It is fairly clear that there is no way to achieve the desired result without additional apparatus. The reversal in agreement status of subjects vs. objects in the inverse forms as opposed to the direct forms, that is, does not follow from any obvious cross-linguistic principles, and is evidently an idiosyncratic property of Potawatomi (along with the other Algonquian languages, which it resembles in this respect). It is not immediately clear, however, to what domain of linguistic structure this fact should be assigned.

We could, of course, achieve the desired result simply by applying the subject agreement rule before the object agreement rule in just these forms. That would have the consequence of making the features of the subject appear in the innermost layer of the morphosyntactic representation, as desired, but some unfortunate consequences would follow from this move. First, there is no other motivation for the assumption that this sort of difference can determine the relative order of rules. In addition, simply reversing the order of subject and object agreement would result in a merger of paradigms (26) and (27); and while they are substantially similar, they must be kept distinct. Rule ordering alone is thus unlikely to provide a solution to the problem of how to describe the inverse forms.

We might, alternatively, attribute the relation between (26) and (27) to the effects of a syntactic operation. We might suggest, that is, that there is a syntactic rule in Algonquian languages which applies to structures of the appropriate sort, and interchanges subject and object noun phrases. If this rule left a morphological mark on the verb, it could keep the two paradigms distinct; while the posited inversion would account for the fact that in these forms objects are treated like the subjects of other forms, and vice versa.

Such a rule — essentially a form of passive — appears to us to contain a substantial element of correctness, but also has some incorrect consequences. Most notably, there is apparently no evidence in the language that the grammatical relations present in inverse forms are substantively different from those in direct forms. There is no reason to believe, that is, that while agents of direct forms have subject properties, it is patients of inverse forms that have these properties; and similarly for object properties. The sort of subject and object properties we are concerned with here are not simply morphological (that, indeed, is what we are out to explain), but rather properties such as triggering reflexivization, undergoing Equi, and the like: the sort of syntactic behavior which has formed the basis of relational grammar (cf. Anderson, 1976 for a discussion of the role of such properties in ascertaining syntactic form). Indeed, there is very little evidence in Algonquian for which noun phrases are subjects in the inverse forms; but the point is that there is no evidence that a syntactic inversion has taken place. The only evidence, to our knowledge, concerns the morphology; and that is again the fact we wish to account for.

There is a certain basis, indeed, for assuming that no inversion
has taken place. In general in Potawatomi, when syntactic rules apply that change grammatical relations, it is necessary to shift the class of the verb to reflect this change. Thus, when reflexivization applies to delete the object noun phrase under coreference with the subject, the resulting form is no longer structurally transitive, but must instead be a corresponding intransitive stem. Similarly, when dative phrases are advanced to object position, the resulting verb form must in general be an animate verb, reflecting the animacy of recipients, benefactives, etc., rather than the inanimate verb which would be used if the thing given, etc. is inanimate. Verb class, that is, is normally in accord with the grammatical relations obtaining in surface structure. In the case of the inverse verb forms, however, the verb class is always determined in the same way as in the direct forms. If we say something like "the knife cut me", that is, we use the animate verb /kiško'm/ in an inverse form, rather than the corresponding inanimate verb /kiško'/, as we would expect if an actual reversal of grammatical relations had taken place. We conclude, therefore, that it would in all likelihood be incorrect to account for the inverse forms by a syntactic rule of the 'passive' type which interchanged subject and object in syntactic structure.

But note that we can, in fact, have our cake and eat it too in this regard. We have seen that it would be inappropriate to posit a change in syntactic structure for the inverse forms; but then, it is not really syntactic structure we wish to change, but morphosyntactic structure. Let us then propose that the correct account rests on a rule which interchanges subject and object in inverse forms, but only in morphosyntactic representation. Such an interchange could be part of the rule that also introduces the formative /uku/, characteristic of the inverse forms:

\[(28) \{ \begin{align*} [v + obv [+anim]] \\
[-me \{+[me\}] \\
[v - you \{+[you\}] \\
\end{align*} \}

\[1 \quad 2 \rightarrow [v \ 2 \ [1]]
\]

This rule, then, has just the right properties: it will result in an interchange of subject and object marking properties, but not in any alteration in their position in syntactic structure. It is thus a morphological rule to account for a morphological fact.

It is morhpologically plausible, however, to suggest that the historical origin of rule (28) was a syntactic passive. In a number of Native American languages, heavy grammatical constraints are imposed on the relative animacy and related features of subject and object. In Navajo, for example, (cf. Creemer, 1974) it is required that the subject outrank the object on a hierarchy of animacy (or more accurately, self-controlability and power to influence affairs). Where this condition is not met, it is obligatory to apply a passive-like rule of inversion to reverse the relative position of the two noun phrases. Similar facts can also be found in the grammar of the Wakashan languages, among others, and we might suggest that such a situation obtained in proto-Algonquian as well. A rule of subject-object inversion, that is, was (perhaps not originally, but eventually) obligatory when the subject and object were not in the appropriate relation: roughly, with first or second person acting on others, and with proximate acting on obviative.

Hockett (1966) gives an excellent account of the scale involved.

Even though this was originally a syntactic process (we hypothesize), the important point is that it became obligatory in a particular configuration. When that happened, it was possible for speakers to treat the resultant surface structures either as syntactically derived, or as perfectly straightforward, with an extra quirk in their morphology. Just exactly the sort of reanalysis of originally syntactic constructions as purely morphological in nature was widely attested in the development of ergative languages from originally accusative systems. In a number of languages, originally derived passives or other periphrastic constructions can be seen to have been re-analyzed as simply morphological debris deposited on normal, active, simple sentence structures (see Anderson, 1977 for some examples and further discussion). This is what we suggest happened in Algonquian as well: when passive (or whatever inversion is involved) became obligatory in a well-defined class of sentence types, it ceased to be regarded as a syntactic process at all, and was re-analyzed as a morphological rule. Of course, in order even to formulate this proposal, it is necessary to have a rather rich theory of morphological rules and representations, such as is suggested here.

We suggest, then, that the fundamental difference between the direct and inverse paradigms is that the latter are subject to rule (28). We can immediately see that the inverse paradigms, in addition to containing the formative /uku/ inserted by that rule, do not contain the theme forming suffix /a/ characteristic of the direct (as well as the TI paradigm); a plausible account of that fact would be to take rule (28) as preceding, and disjunctively ordered with respect to, rule (20) which introduces the /a/.

When we turn to the remainder of the material present in the paradigm (27), we see that much of it now follows from rules we have already established. The prefix elements (/k-, /n-/, and /w-) are inserted by rules (16a), (16b) and (7c); final /-k/ for plural, and /-n/ for obviative, now follow from rules (3a), (3b); and the element /-wa/ marking non-first person objects is inserted by rule (23). The only remaining element of the paradigm is /-nan/, marking first person plural object (inclusive or exclusive). If (27) were precisely the inversion of (26), as (28) suggests, this element ought instead to be /-mun/ (with consequent loss of following /-k/ or /-n/).

We do, in fact, have a rule in the grammar which should clearly be the source of this /-nan/: rule (8a) introduces /-nan/ to mark first person plural possessors in nouns. Clearly it would not do to simply extend this rule to verbs as well; for then we would incorrectly replace /-mun/ with /-nan/ in the TI and TA direct paradigms as well. There are two other options open to us, however: we could either give a disjunctive structural description to rule (8a), allowing it to apply either to possessed noun constructions or when the verb stems end in /uku/; or we could change rule (28) slightly so that its output is structurally like a possessed noun construction:
and we can obtain that result if we allow the rule introducing /a/ (rule 20), clearly the 'elsewhere' case for transitive theme formations) to follow all of the others in a disjunctive relationship:

(31) a. [[+you]]

\[ /X/ \to /X+a/ \]

b. [[+me]]

\[ /X/ \to /X+y/ \]

c. [[+me]]

\[ /X/ \to /X/ \]

This 'θ-suffixation' rule is similar in form to rule (25), about which we expressed some reservations above, but seems quite well motivated.

Passing on to the post-theme suffixes, we see first that the forms with first person plural subject have the suffix /-mm/, as rule (21) would predict. Since rule (21) is formulated to apply to structures in which the first-person plural features appear either in the inner or in the outer layer of a complex morphosyntactic structure (recall that this was necessary to account for the appearance of this formative in the AI, as well as the transitive paradigms), it will also correctly introduce the element /-mm/ in forms with 4pl object. The only additional material to be accounted for is the formative /-m/ which appears in forms with a second person plural but no first-person plural participant.

Of course, we already have a rule for this element: recall rule (17b), which introduced /m/ to mark second person plural in the AI paradigm. As it stands, this will correctly mark the form kwapnumun "I see you (pl)", but not kwapnumun "you (pl) see me", since it only applies to morphosyntactic representations with second person plural in their inner structural layer. If we simply extend the rule to forms with second person plural in either layer, however, we will get into trouble: in the direct and inverse paradigms above in (26) and (27), forms with second person plural subject (or object, in the inverse forms) are marked with /-wa/ instead. We must thus restrict the extension of /-m/ to outer-layer environments to the you-and-me forms.

The most straightforward way to do this would be to restrict the /-wa/ rule to non-you-and-me forms, and to order it before (and disjunctively with) the newly extended /-m/ rule. We thus replace rules (23) and (17b) with the following pair of rules:

(32) a. 

\[ /+plur \to /+wa/ \]

b. 

\[ /+you \to /+m/ \]

We have now accounted for all of the forms of the noun, possessed noun, pronoun, and independent indicative verb affirmative paradigms from all four classes of verb in Potawatomi. A summary of the complete system of rules involved will be found in the appendix.
In our discussion of the Potawatomi material above, the rules which have been cited have all been of fairly simple sorts. With the exception of rule (29), the inversion rule, all have consisted simply of the addition of a suffix (including the possibility of 0); rule (29) in addition performed a change on the morphosyntactic representation itself. These are not, of course, the only formal operations that appear in morphological systems: other possibilities include reduplication, infixation, substitutions such as the ablaut in English take/took, and deletions. This latter possibility is perhaps the most controversial, but appears in some languages: as discussed by Anderson (1975), Danish has a rule which forms the imperative by deleting a final schwa vowel from the infinitive, and Abkhaz has a rule deleting verb-initial /y/ under specifiable morphological and syntactic conditions. Though they are certainly unusual, such deletion processes undoubtedly occur in natural languages.

Our interest here, however, has been less in the formal changes performed by morphological rules (a topic which has received much discussion in both the structuralist and recent literature) than in the formal organization of morphological systems. We have concluded that an inflectable form should be considered as associated with a complex of features, which constitute its morphosyntactic representation. Rules of the morphology then refer simultaneously to this representation and to the phonological shape of the form in developing the concrete realizations of its morphological properties.

We have observed that in many cases a single feature can be relevant to the operation of several distinct rules; and further that a single rule may refer to several distinct properties of the morphosyntactic representation. The reader is invited, if he is not yet convinced of the difficulties presented by the classical notion of the morpheme, to attempt to recast the description of Potawatomi given above in terms of one-to-one associations between clusters of features and stretches of phonetic material! From this, we conclude that rules of the general character assumed in this study are appropriate to morphology. We also feel it has been demonstrated that morphosyntactic representations can have a certain amount of internal structure, and that in some cases that structure may even be manipulated by morphological rules.

It is in the area of the interaction of morphosyntactic rules with one another that we have made a number of assumptions which we would like to make explicit for further discussion. Recall that we assume that these rules are organized into blocks, with the rules in each block related by a principle of disjunctive ordering. The blocks, in turn, are related by a relation of sequential ordering (though of course this relation is in the general case heavily underdetermined, and may ultimately turn out to be local rather than linear, as is also the case for strictly phonological rules), which is responsible (along with other things) for determining the relative ordering of affixes. There are a number of empirical issues involved in this framework, which deserve further examination; we propose here to argue that at least the amount of formal flexibility provided by this model is needed in morphological systems.

There are three basic degrees of freedom incorporated into this descriptive framework, each of which is assumed to be (at least potentially) idiosyncratic and subject to language-particular variation. These are: a) the relative ordering of given blocks of rules; b) the relative order of rules internal to a disjunctive block; and c) the question of whether a given pair of rules are related conjunctively or disjunctively (subject to certain limitations). We will cite examples here which argue for each of these properties that it is indeed variable on a language-particular basis, and thus could not be considered entirely an aspect of the universal framework for morphological description.

The relative ordering of blocks in a description is certainly the most obvious candidate for language-particular status. Still, it is the case that by and large, the rules which are arranged into a disjunctive block relate to roughly similar properties; and it is often possible to relate a whole block to various options along some reasonably unitary dimension of syntactic, semantic, or perhaps purely morphological structure. If that were the general case, we might then imagine that some overall principles of syntax, etc., could determine the relative sequence of such functions.

That this is not the case is shown by the fact that related languages may have rule schemata encoding the same general functions, but in different orders in different languages. The languages of the Uralic family, for example, generally have inflectional schemata for the categories of case, number (these are sometimes combined), and possessor. In Finnish for example, we find the following partial paradigm:

(33) kirja "book" kirjani "my book"
kirjat "books" kirjani "my books"
kirjassa "in the book" kirjassani "in my book"
kirjoissa "in the books" kirjoissani "in my books"

Though there is a certain amount of morphophonemic variation in this material (for instance, the plural ending /-s/, as well as the genitive ending /-n/, are lost before the possessive endings; and stem-final /a/ is changed to /o/ before /i/ in these forms), we can clearly see that the sequence of inflectional development is: number, case, possessor.

Compare the Finnish data above with corresponding forms from Vogul:

(34) haap "boat" haapum "my boat"
haapanum "my boats" haapuntu "in my boat"
haapanumt "in my boats"

In this language we can see that the same functions are ordered after the stem differently, viz. as number, possessor, case. Given the apparent absence of any other relevant difference between the role of these categories in Vogul as opposed to Finnish, we conclude that the relative order of at least the case and possessor schemata is subject to language-particular variation.

Let us now take up the question of the relative order of a pair of rules that are part of a single schema. In the dialect of Cree (an Algonquian language, like Potawatomi) cited in e.g. Goddard, 1967, the inflections of the you-and-me forms of the TA verb are as follows:
The final point concerning the organization of systems of rules of the sort we have been considering which we wish to take up here is the matter of whether a given pair of rules must be disjunctively related or not. In phonological studies most linguists have presumed that the disjunctive ordering, where it occurs, is predictable by some general principle; yet we have claimed that it is at least to some extent a language particular fact about the organization of morpho-

ical systems whether a given pair of rules are organized into a single schema or not.

This is undoubtedly the organizational point assumed here which is most likely to yield to prediction by general principles. Indeed, Wurzel (1975) has claimed that it is always possible to determine, on the basis of the morphosyntactic environments of a pair of rules, whether they belong to the same schema or not. An apparent counter-examples which he considers comes from the history of Swedish. In early Old Swedish, as in Old Norse, case and number were realized together in a single set of inflectional endings for nouns:

(37) hūrr "gentleman" (nom. sg.)
    hūrrs (gen. sg.)
    hūrrar (nom. pl.)
    hūrra (gen. pl.)

At this stage, presumably, all of the inflectional endings were part of a single disjunctive schema. Subsequently, however, the inflection of the genitive plural of nouns (at least) this class was altered. In addition to the regular genitive plural ending -/a/, the ending for the genitive singular was added as well to produce the form hūrras. Apparently, this was due to a general re-organization of the inflectional system of Swedish at this time. With the disappearance of distinct endings for the dative and accusative, the genitive endings were to some extent isolated; and the result was a realignment of the remaining inflectional rules into two distinct schemata, one for plural endings and one for genitives:

(38) a.i. [+gen] [+plur]
    /X/ \ X+a/  
     
    b. 1. [+gen] [+plur]
             /X/ \ X+a/  
    2. [+plur]
             /X/ \ X+a/  
    iii. [+gen] [+plur]
            /X/ \ X+a/  

The fact that rule (36d i) precedes (36d ii) forms the precedence of first-person plural marking over second person plural marking in this system.

This is not the only system found in Cree, however. In another dialect, referred to by Hockett (1966:67) and attested in Bowes (1865), the form for "we (see) you (pl)" does not have the inflection ki-X-itina as in (35) but rather ki-X-in:wa:w. Similarly, "you(pl) (see us)" is not inflected as ki-X-in:wa:w but rather as ki-X-in:wa:w. Otherwise, the 'you-and-me' paradigm in these two forms of Cree are identical. Clearly the two dialects have exactly the same set of rules, and differ precisely in the relative ordering of rules (36d i) and (36d ii). We therefore presume that the relative ordering of a given pair of rules within a single schema is not something which is in general predictable from general principles.
ticular, with rule (38a ii)) with which it had previously been disjunctive. Such a development would appear to be a case in support of the claim that the disjunctive relation between a given pair of rules is a property of particular grammars, not predictable from general principles.

Karzel argues, however, that this is not a counterexample to the claim that disjunction is always predictable, because the wholesale reorganization of the Old Swedish inflectional system has resulted in rules which (by principles he suggests) should simply be schematized in a different way than those of the original system. We do not review his suggested account here, but merely note that it is clear that a radical enough change has taken place in the history of Swedish to make at least marginally plausible the contention that rule re-organization on general principles has also taken place. Thus, it would appear that all that has changed in moving from (38a) to (38b) is the interaction among the rules; but this is not a completely clear case of such change.

It is quite likely that such changes will be found, however. It is not by any means uncommon for a language to develop such 'double suffixed' as that found in Nargar, and where such a situation can be attested as a consequence of a historical change, it will often turn out that what is involved is the 'deschematization' of an originally disjunctive pair of rules so as to make them conjunctive. In the history of English, indeed, some such changes can be observed: when the regular development of noun inflection had left the plural form childer from OE childru (as well as a few others, such as bye from OE cy, brether from broðer) isolated, this form was re-inforced by the addition of another plural ending -n, giving children (kine, brethren). There is no obvious alternative to saying that, at least originally, this development consisted in making conjunctive a pair of rules which had previously been disjunctive.

Similar examples can be provided from other languages, as well. In Breton (cf. Jépos, 1957) we find a welter of distinct forms for the plural of nouns. In many cases, however, one of the rarer forms of the noun plural is reinforced by the addition of one of the more common: thus, lermed "fowes", from lourun, in addition to the regular plural by simple vowel change ler; hernyo "irons", from sg. hounr in addition to regular hern, etc. In these cases, the isolation of some of the rules of plural formation is apparently reflected in their separation from the usual disjunctive schema of such mutually exclusive rules.

Another sort of example is given by Kuryłowicz (1949), who notes that the German diminutive suffixes -chen and -lein arose when an original diminutive -k or -l was reinforced by the addition of another diminutive suffix, -in. Again, we can see in this development the replacement of a disjunctive relationship by a conjunctive one.

It is interesting to observe that the only apparent cases in which the disjunctiveness of the relation between two rules is altered have the character of the 'reinforcements' noted above: cases, that is, in which originally disjunctive relationships are replaced by conjunctive ones. We do not know of any examples in which a conjunctive relation between two rules is replaced by a disjunctive one; and indeed, if

Kuryłowicz' First Law of Analogy ('un morphème biparti tend à s'assimiler un morphème isofonctionnel consistant uniquement en un des deux éléments, c.-à-d. le morphème composé remplace le morphème simple') is correct, we ought not to find such cases in morphological change. Nevertheless, it is clear what would constitute a case of this sort: Suppose, for example, we had a language with a constant mark for the plural of nouns; and suppose furthermore that one of the case endings that could be added to nouns in addition to number marking had distinct forms for the singular and plural. Then if the ordinary plural ending were lost in precisely that case where another distinctive case/number ending existed, we would want to describe this fact as the incorporation of the case-marking rule into the number-marking schema. If such cases exist, however, we have not yet been able to uncover them.

In the discussion above, we have raised only a few of the questions to which answers are desirable if a correct framework for morphological description is to be provided by linguistic theory. We are painfully aware of the anachronism of announcing the discovery of morphology; nonetheless, we hope to have provided an example of the usefulness of raising questions about morphological structure in terms of the construction of a formal descriptive system, and thereby to have contributed to the renewal of interest in this area of linguistic structure. In a sense, such as what goes on in morphology is exquisitely boring, since it is just here that most of what is idiosyncratic and unsystematic about languages is concentrated. When one looks, however, it may turn out that there is a method for exploring this apparent madness.

Notes

1Our information on Potauvami comes primarily from Hockett (1948, 1966) and to a lesser extent from Goddard (1967). We make no claims to have discovered anything particularly novel about the structure of the language; the analysis below is primarily just a slightly more formal presentation of the admirably lucid treatment of Hockett (1966). Our purpose in performing this exercise in restatement is simply to examine the results of applying a descriptive framework originally motivated by rather simple cases to a language of somewhat greater complexity.

2Hockett does not actually cite a complete paradigm of a TI verb; we take this from the appendix to Goddard (1967), which is also derived from Hockett's work.

References


Appendix: Morpholexical Rules of Potawatomi Inflection

Rules grouped together under a single Roman numeral are assumed to apply disjunctively; distinct Roman numeral schemata apply conjunctively in the sequence given.

I. Theme Formation

a. (=6) \[ N[+M] \]
   \[ /X/ \rightarrow /X+m/ \]

b. (=29) \[ [v+obv [+anim]] \]
   \[ \begin{cases} 
   \left[ [me [+me]] \right] \\
   \left[ [you [+you]] \right] 
   \end{cases} 
   1 \quad 2 \quad \Rightarrow \quad \left[ [v \ 2 \ N \ 1 \ ] \right] 
   \]
   \[ /X/ \rightarrow /X+uko/ \]

c. (=31a) \[ [+you] \]
   \[ /X/ \rightarrow /X*n/ \]

d. (=31b) \[ [+me] \]
   \[ /X/ \rightarrow /X+y/ \]

e. (=31c) \[ [+me] \]
   \[ /X/ \rightarrow /X/ \]

f. (=20) \[ [v[]] \]
   \[ /X/ \rightarrow /X+a/ \]

II. Prefixation augment

(=11) \[ N[1] \]
   \[ \begin{align*} 
   \text{Obl:} & /\{o,u\} \ X/ \\
   \text{Opt:} & /C \ X/ 
   \end{align*} \]
   \[ 1 \ 2 \ \Rightarrow \ /t+1 \ 2/ \]

III. Prefixation

a. (=16a) \[ [+you \ (\[]\)] \]
   \[ /X/ \rightarrow /k+X/ \]

b. (=16b) \[ [+me \ (\[]\)] \]
   \[ /X/ \rightarrow /n+X/ \]

c. (=7c) \[ [\[] \]
   \[ /X/ \rightarrow /w+X/ \]

IV. TI suffix for non-first plural subjects

(=22) \[ [-me \ [+plur \ [+anim]]] \]
   \[ /X/ \rightarrow /X+na/ \]
V. Suffixation
a. (=8a) $[+$me +plur $[\mathbf{w}]$]
   \[/X/ \quad \rightarrow \quad /X+nan/\]
b. (=21) $[+$me +plur $[\mathbf{1}]$]
   \[/X/ \quad \rightarrow \quad /X+mun/\]
c. (=32a) $[+$plur $[-you]$ $[-me]$]
   \[/X/ \quad \rightarrow \quad /X+wa/\]
d. (=32b) $[+$you +plur $[\mathbf{1}]$]
   \[/X/ \quad \rightarrow \quad /X+m/\]
e. (=24) $[\mathbf{v}[-anim]]$
   \[/X/ \quad \rightarrow \quad /X+n/\]
f. (=14a) $[[-anim] +\text{plur}]$
   \[/X/ \quad \rightarrow \quad /X+to/\]
g. (=14b) $[[-anim] +\text{obv}]$
   \[/X/ \quad \rightarrow \quad /X+n/\]

VI. Outer suffixation
a. (25) $/X+mun/ \quad \rightarrow \quad /X+mun/\]
b. (=3a) $[-me -you +\text{anim} +\text{plur}]$
   \[/X/ \quad \rightarrow \quad /X+k/\]
c. (=3b) $[-me -you [+$plur] [+\text{obv}]$
   \[/X/ \quad \rightarrow \quad /X+n/\]