

MORPHOLOGY

Critical Concepts in Linguistics

Edited by
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Morphology: its Relation to Syntax



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THE MIRROR PRINCIPLE AND MORPHOSYNTACTIC EXPLANATION

Mark Baker

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Pretheoretically, there are processes in languages of the world that have both a syntactic component and a morphological component. An example is the English passive, illustrated in (1):

- (1) a. The cats chase the mouse every day.
- b. The mouse is chased by the cats every day.

(1b) differs from (1a) in two ways. First, the NP that bears the patient or “logical object” semantic role appears as the surface direct object in (1a) but as the surface subject in (1b). Second, the main verb in (1b) is morphologically derived from the (stem of the) verb in (1a) by suffixing the *-ed* morpheme. Any complete account of the passive construction will have to encompass both of these aspects, the syntactic and the morphological. On this, all are agreed. How to integrate the two components into a unified account is another matter, however, and differing viewpoints abound regarding which component is primary and which is derived, at what level(s) of representation the two are explicitly related, and so on (for a cross section, see Chomsky (1981), Bresnan (1982c), Perlmutter and Postal (1977), Marantz (1981)). Part of the reason for this diversity is that the phenomena in and of themselves do not supply a wide enough range of evidence to guide theoretical decisions in this area. This article will shed new light on these issues by considering interactions of these processes in morphologically complex languages. In particular, it will argue that the morphology and the syntax in this class of cases must be two aspects of a single process. This result in turn will be shown to place strong,

substantive constraints on the kind of syntactic framework that should be adopted.

1. The Mirror Principle introduced

Consider the pattern of verbal agreement in the Austronesian language Chamorro (data from Gibson (1980)):¹

- (2) a. Man-dikiki'.
 pl-small
 'They are small.'
- b. Para#u#fan-s-in-aolak i famagu'un gi as tata-n-niha.
 irr-3pS-pl-pass-spank the children obl father-their
 'The children are going to be spanked by their father.'
- c. Hu#na'-fan-otchu siha.
 IsS-caus-pl-eat them
 'I made them eat.'

The focus of attention here is on the prefix *man-/fan-*.² Gibson states that this morpheme appears in a simple clause if and only if the clause is intransitive and has a plural subject. (2a) gives a typical example of this situation. The passive structure in (2b) fits with this generalization as well—as long as we take the generalization to refer to surface representation and not to an “underlying” or “semantic” representation. Thus, *fan-* agrees with the plural NP ‘children’, which is the derived subject, but not the singular NP ‘their father’, which is the underlying subject. Furthermore, the underlying clause would be transitive, not intransitive as is required for *fan-* to appear. The morphological causative in (2c), on the other hand, leads in exactly the opposite direction. Here *fan-* agrees not with the surface subject of the sentence ‘I’, which is singular (as shown by the other agreement morpheme *hu*), but rather with ‘them’. This nominal is the underlying, semantic subject of the root ‘eat’, but on the surface it is a direct object. Similarly, the sentence is transitive on the surface, which should disallow *fan-*, whereas the root verb ‘eat’ is intransitive in this usage. Therefore, we can keep our generalization about the distribution of *fan-*, but this time the generalization must crucially refer to an underlying representation, rather than the surface one.

How do we understand this behavior of *fan-* verbs? As a preliminary step, notice that another factor exactly correlates with these differing syntactic characterizations of the verbal agreement: the differing position of the agreement morpheme in the verb’s morphological structure. In (2b), where agreement is with the surface subject, the agreement morpheme occurs outside the passive morpheme, which is between it and the verb root; in (2c) agreement is with the underlying subject and the agreement morpheme occurs inside the causative morpheme, between it and the verb root.

Or consider the following sentences from Quechua, a South American Indian language (data from Muysken (1981)):

- (3) a. Maqa-naku-ya-chi-n.
 beat- recip- dur- caus- 3S
 'He_i is causing them_i to beat each other_i.'
 b. Maqa-chi-naku-rka-n.
 beat- caus- recip- pl- 3S
 'They_i let someone_j beat each other_i.'

Even though these two sentences contain essentially the same morphemes, they have very different interpretations: in (3a) the semantic subject of the verb root 'beat' and its direct object are understood as being in a reciprocal relationship, whereas in (3b) the causer and the direct object are understood in this way. How are we to explain this difference? Why aren't the interpretations the other way around?

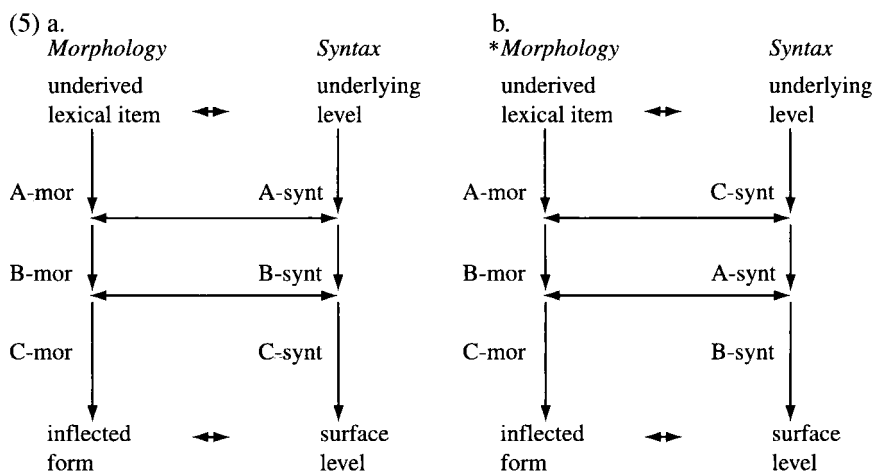
Once again, the key is the morphological structure of the two verbs involved—in particular, the relative order of the causative and reciprocal morphemes. In (3a), where the reciprocal binds the object to the underlying subject, the reciprocal morpheme is inside the causative morpheme, that is, closer to the verb stem. On the other hand, in (3b), where the reciprocal binds the object to the causer, which is the surface subject (as confirmed by the plural agreement in (3b)), the reciprocal morpheme is outside the causative morpheme, farther from the verb stem.

Based on these observations, it seems that these two very different sets of facts can be explained and conceptually unified in terms of a theory of how the morphological and syntactic components are related. Indeed, they are explained by the simple statement that the processes involved—passive, agreement, causative, and reciprocal—simultaneously have morphological effects (such as adding an affix to the verb) and syntactic effects (such as changing grammatical functions). This is not necessary a priori; it is certainly imaginable that Universal Grammar would allow a dissociation of the two, such that each happens independently and the results must be consistent with one another. In fact, two currently influential frameworks, Government-Binding Theory and Relational Grammar, have this property, at least in some cases (see the discussion in section 6). However, I argue on the basis of facts like those shown above that any framework that does not start by unifying the morphological and syntactic aspects of these processes must in effect do so by stipulating a principle of Universal Grammar that might be stated informally as follows:

(4) *The Mirror Principle*

Morphological derivations must directly reflect syntactic derivations (and vice versa).

Suppose for illustration that the analysis of a given structure involves three processes, A, B, and C, and that all of these processes have both morphological and syntactic components. Then by (4), the morphological and syntactic derivations must match, as shown in (5a). If they do not, as in (5b), then the structure is ruled out by this principle. (The issues represented here will be developed more fully below.) The form of my argument will be as follows: I will show that, given independently motivated facts about morphology and syntax taken in isolation, the Mirror Principle explains the observed patterns in Chamorro, Quechua, and many other languages. More than that, it limits the class of possible morphological structures and how they may be related to syntactic structures in a way that seems to be correct universally. Thus, the Mirror Principle is needed to fill a gap in the program of explanatory generative grammar. This will then be interpreted as evidence for a syntactic framework in which morphology and syntax can be directly related to the same processes, because only in this case will the generalizations about language encoded in the Mirror Principle follow naturally.



The article is organized as follows. Section 2 through 5 will establish that something with the content of the Mirror Principle is true and necessary. Specifically, section 2 will make explicit certain morphological and syntactic preliminaries that the Mirror Principle rests on. Section 3 will take up predictions that the Mirror Principle makes concerning the interactions between agreement and processes that change grammatical functions, and will show that they explain the Chamorro data and extend to other languages. Section 4 will do the same for interactions between processes that change grammatical functions, explaining the Quechua phenomena and again extending to unrelated phenomena in other languages. Section 5

will discuss an apparent counterexample, as well as conditions on the applicability of the Mirror Principle. Finally, section 6 will consider what kind of syntactic framework can satisfactorily reduce the Mirror Principle to basic properties of grammar, and will discuss implications for the learnability of morphology and the morphosyntactic interface.

2. The content of the Mirror Principle

To say that syntactic derivations and morphological derivations are identical (or isomorphic), one must have notions of “syntactic derivation” and “morphological derivation” that have independent content. Therefore, in this section I will make explicit certain implicit assumptions about the nature of morphology and the nature of syntax. On the other hand, I will (as much as possible) suppress assumptions in these areas that are not crucial for current purposes, in order to make clear exactly what foundation the arguments rest on. In particular, I do not intend the syntactic representations described here as a serious syntactic proposal per se, still less a new syntactic framework, but rather an abstraction of certain properties shared by a range of frameworks.³ I will address the issue of syntactic framework more completely in section 6.1, in terms of what syntactic assumptions are most compatible with the generalizations I have put forth.

2.1. *The morphological side*

The defining property of morphology will be that it is concerned with the structure of words. Thus, morphology expresses those relationships between words that are part of a speaker’s knowledge of his or her language, and describes how words can be constructed from smaller units (morphemes).

The first empirical assumption about morphology is that there is no purely morphological distinction between derivation and inflection (cf. Lieber (1980)). This assumption rests on the well-known observation that there are in general no phonological or morphophonological differences between the two classes of processes. For example, one cannot give universal principles that distinguish the shapes of what one intuitively calls inflectional affixes from the shapes of what one calls derivational affixes. Similarly, there are no evident differences in the types of phonological rules triggered by a given affixation that suffice to define the two classes. Reasons like these have motivated morphologists working in the framework of Lexical Phonology and Morphology to include both kinds in the lexicon (e.g. Kiparsky (1982)).⁴ Likewise, Anderson (1982) considers a variety of definitions of the intuitive difference—including definitions in terms of productivity, category changing, and simple listing—and rejects them all. He concludes simply that “Inflectional morphology is what is relevant to syntax.” I will adopt this

characterization, along with its obvious implication that the distinction is not purely morphological as morphology is defined here.

The second empirical assumption about morphology is that it is by nature ordered and cyclic. In other words, morphological processes are taken to apply to a given form one at a time, in a well-defined order, working from the inside outward. For example, consider the English word *derivationally*. It has specifically the layered morphological structure (6a), and not the flat structure (6b) or an arbitrary binary branching structure such as (6c):

- (6) a. [[[[derive] ation] al] ly]
- b. [derive + ation + al + ly]
- c. [[derive [[ation] al]] ly]

Thus, there is a well-defined (although not necessarily temporal) sense in which *-ation* is added to *derive* first, then *-al*, and finally *-ly*. This assumption rests in part on the phonological evidence for the “strict cycle,” which shows that for the purposes of applying phonological rules correctly, words must have structures like (6a) that are interpreted from the inside outward. Then our assumption, following Lexical Morphology (Pesetsky (1979), Kiparsky (1982; 1983)), is that this well-known property of phonological rule application is a reflection of the fundamental manner in which words are constructed.⁵

These two assumptions lead to a simple conclusion. Given a portion of a word of the form (7a),

- (7) a. . . . verb-affixA-affixB . . .
- b. . . . [. . . [[verb] affixA] affixB] . . .

then from the ordered, cyclic nature of morphology, we conclude that part of the structure of the word is as shown in (7b)—that is, that affixA is attached before affixB.⁶ Furthermore, given the unity of inflection and derivation from a strictly morphological viewpoint, this conclusion is valid for inflectional morphology as well as for derivational morphology, where it is more familiar. Thus, the order in which morphemes appear on the verb reflects the order in which the morphological processes that add those morphemes apply. This then gives the independent content to the notion of a morphological derivation that is needed to make the Mirror Principle meaningful. Specifically, the Mirror Principle claims that the morphological ordering known via the morpheme order must match the syntax (and vice versa). Thus, in example (7) it would claim that the syntactic process associated with affixA must occur before the syntactic process associated with affixB. This is one source of the empirical content of the principle.

2.2. *The syntactic side*

The defining property of syntax will be that it is concerned with the structure of sentences. Thus, syntax expresses the relationships between sentences that are part of a speaker's knowledge of his or her language, and how sentences can be constructed from smaller units (lexical items). Syntax is thus particularly involved in capturing generalizations that refer to phrases and to the relationships between phrases and lexical items.

The first empirical assumption about syntax is that it includes a "deep" level of description, where semantic-thematic relationships are explicitly represented. To make the discussion concrete, consider once again the active-passive sentence pair in (1), repeated here:

- (8) a. The cats chase the mouse every day.
 b. The mouse is chased by the cats every day.

One of the things that native speakers of English know about (8a) and (8b) is that the NP *the mouse* has the same semantic relationship to the verb *chase* in both sentences—it refers to the being that is pursued. This is true even though this NP appears in different positions in the two sentences. This common property will be expressed by associating the two sentences with the same representation at a "semantic" (= thematic) level, as in (9):

- (9) NP1 VERB NP2 — —
 subject object i-object oblique . . .

where VERB = *chase*, NP1 = *the cats*, NP2 = *the mouse*. This follows an intuition that (8a) is more basic than (8b), so its structure is closer to the underlying structure.⁷ Thus, we say that in both sentences *the mouse* is a semantic object.

The second assumption about syntax is that there is another level of description (at least), a "surface" level that is more directly related to what is actually said (i.e. to a sentence's "phonological form"). At this level, (8a) and (8b) will differ significantly in a way that corresponds to the difference in the surface relationships that hold between *the mouse* and the verb in the two sentences: the different syntactic constituency, the different number agreement on the verb, and so on. The surface structure of (8a) will be essentially isomorphic to (9), but the surface structure of (8b) will be (10):

- (10) NP2 VERB — — NP1
 subj obj i-obj obl

Moreover, this level of representation expresses not only the different relationships between *the mouse* and the verb in the two sentences, but also the

similarities between the role of *the mouse* in (8b) and the role of *the cats* in (8a). These do appear in the same structural configuration, determine number agreement on the verb, and so on. Thus, we say that they are both surface subjects.⁸

Third, I assume that there exists a nontrivial mapping that relates semantic level representations to corresponding surface level representations. Thus, as a special case, a given semantic relationship between an NP and a V need not always correspond to the same surface relationship between that NP and V. This claim is already implicit in the claim that sentences have more than one level of representation, and we have already seen motivation for it in the discussion of the passive sentence (8b), which is associated with two non-isomorphic structures (9) and (10).⁹ The mapping then says that this pair of structures can be (part of) the analysis of a grammatical sentence, whereas other imaginable pairs cannot. An example of an improper pairing, and hence something that is not part of the mapping function, is given in (11):

- (11) a. Semantic level: NP1 VERB NP2
 subj obj
 b. Surface level: NP2 VERB NP1
 subj obj
 c. The mouse chases the cats (every day).
 (Meaning, "The cats chase the mouse every day.")

It is an interesting and important goal of syntactic theory to explain the properties of this mapping and to reduce it as much as possible to an interplay of general principles. Nevertheless, independently of the results of such a project, it is fairly clear that legitimate subparts of this mapping will break up into specific classes with recognizable properties. These classes can then be conveniently thought of as instances of a particular "rule" and can be used as such, without worrying about how they may be reducible to more general principles.¹⁰ I will take this approach here, and it is in this sense that I will speak of (for example) Passive as a "syntactic rule." In the notation used above, Passive can be conveniently represented as follows:

- (12) *Passive*
 NP1 VERB NP2 → NP2 VERB — NP1
 subj obj subj obj obl

Other such "rules" will include Causative, (lexical) Reflexive-Reciprocal, and "Applicative" rules.¹¹ These will be introduced as they come up in the following sections. All four modify grammatical functions, are highly productive, and are associated with characteristic (verbal) morphology in many languages. As a class, they will be referred to as *GF-rules* (for "grammatical function changing rule").

Another relevant syntactic relation is agreement—namely, the relation that holds between a verb and a noun phrase that bears a grammatical function with respect to that verb, such that the morphological shape of the verb is determined in part by the grammatical features of the noun phrase (number, person, gender, etc.).¹² This too is familiar from English in a limited way, and can be seen in the active-passive pair in (8). In (8a) the plural subject NP *the cats* requires a particular form of the verb (*chase*, not *chases*), whereas in (8b) the singular surface subject *the mouse* requires a different form of the verb (*is* and not *are*). In general, English verbs show number agreement with their surface subjects in the present tense. Other languages have much more robust agreement phenomena, including agreement with direct and indirect objects as well as subjects, agreement with underlying grammatical functions as well as surface ones, agreement in all tenses, and so on. I will assume that agreement can be universally represented as establishing a relationship between a verb and an NP that is one of its associated grammatical functions (at a particular point in a derivation). This relationship will be represented by cosuperscripting. For example:

- (13) a. NP1ⁱ VERBⁱ NP2 NP3 (subject agreement)
 subj obj obl
 b. NP1 VERB^j NP2^j NP3 (object agreement)
 subj obj obl

Furthermore, I will assume that (in the unmarked case)¹³ this agreement is uniform, in the sense that a particular kind of agreement morphology will always signal a relationship between a verb and a unique grammatical function. For example, no single agreement morpheme can induce coindexing between the verb and its subject in some cases and a verb and its object in other cases. Agreement, however, is allowed to precede the GF-rules, and this will generate superficial counterexamples in some languages. For instance, the representation in (13b) might undergo Passive, creating a structure like (14), where the verb shows “object agreement” with its (surface) subject:

- (14) NP2^j VERB^j — NP1
 subj obj obl

Here of course the sentence is expected to show other signs of its passive nature. Since agreement is a relationship between a lexical category (V) and a phrasal category (NP), it is a syntactic process, according to the definition given at the beginning of this section. However, it is obviously (necessarily) associated with productive morphological processes as well. Hence, agreement processes are quite similar to the GF-rules, the only important difference being that whereas the latter change grammatical functions, the former only refer to them.

Now consider the general case, where more than one GF-rule or agreement process must be appealed to in the analysis of a given sentence. Since we are purposely focusing on processes that crucially involve grammatical functions, the output of any one process will depend on the GF-structure that it gets as input, which in turn will depend on which (if any) processes have happened before it. To put this another way, these processes stand in potential “feeding” and “bleeding” relationships to one another. Whether we actually observe “feeding” or “bleeding” between the two rules will give us syntactic evidence concerning the order in which they must have applied. For example, consider again Passive and Object Agreement. If a given structure in some language shows no object agreement with the surface subject of a passive sentence, then Passive “bleeds” Object Agreement. Hence, Passive must apply first. On the other hand, if the structure does show object agreement with this nominal, Object Agreement must apply first, because of the uniformity constraint on agreement. In this way, we can establish a syntactic derivation for a given structure in which independently characterizable processes apply in a particular order to account for the properties of that structure. This gives the independent content to the notion of “syntactic derivation” that is needed to make the Mirror Principle meaningful. Specifically, the Mirror Principle now claims that the syntactic ordering known via examination of these feeding and bleeding relationships must match the morphological ordering known independently by examining morpheme orders. Thus, the Mirror Principle will have strong empirical consequences.

3. Interactions between GF-rules and agreement

In this section I will show first how the agreement facts from Chamorro introduced in section 1 can be explained using the Mirror Principle and then how the results of that discussion can be generalized to predict a restrictive universal typology of agreement, which is correct over a range of languages.

3.1. *Chamorro and fan- agreement*

Consider once again the pattern of Chamorro verbal agreement given in (2) (repeated here):

- (15) a. Man-dikiki'.
 pl-small
 'They are small.'
- b. Para#u#fan-s-in-aolak i famagu'un gi as tata-n-niha.
 irr-3pS-pl-pass-spank the children obl father-their
 'The children are going to be spanked by their father.'

- c. Hu#na'-fan-otchu siha.
 1sS-caus-pl-eat them
 'I made them eat.'

We have seen that *fan-* normally shows the plurality of the subject in an intransitive clause, as in (15a). However, in passive sentences like (15b) the relevant sense of “subject” is crucially “surface subject,” whereas in causative sentences like (15c) it is crucially “semantic subject.” Furthermore, this difference correlates with a difference in morphological structure: in (15b) *fan-* precedes the passive marker *-in-*, whereas in (15c) it follows the causative marker *na'-*. This correspondence led us to posit a direct link between morphological structure and syntactic structure, encoded by the Mirror Principle. We now return to the task of showing that this principle plays an important role in explaining the interactions of Chamorro's agreements and GF-rules, given an understanding of how these processes work individually.

The Chamorro agreements and GF-rules are clearly described by Gibson (1980). I follow her exposition here, translating her generalizations into the notation presented in section 2.

(i) *man-/fan-* agreement. Morphologically, the proper morpheme is simply prefixed to the verb. Syntactically, Gibson states the following generalization: “The prefix *man-/fan-* is attached to the predicate of a finally intransitive clause if and only if the final 1 [= subject] of the clause is plural” (p. 25). In our terms, this can be represented as follows:

- (16) *Number Agreement (Chamorro)*
 NP1 VERB ... → NP1' VERB' ...
 subj subj
 Condition: Nothing fills the object slot.

Here, the cosuperscripting relation expresses number agreement, the plural form being *man-/fan-* and the singular form \emptyset .

(ii) Passive. The passive has two morphological shapes, *ma-* and *-in-*, the choice between the two depending roughly on the number of the semantic subject and to some extent on the animacy of the semantic object. *Ma-* is a normal prefix, *-in-*, on the other hand, can appear two ways. Usually it occurs infixed into the stem, placed immediately after the stem's first consonant. If, however, the stem begins with a liquid or a nasal, the affix is metathesized to *ni-* and is prefixed to the verb root. Abstracting away from the details, in all these cases the passive is attached in a position definable only in terms of the beginning of the stem, making it a prefix in a slightly generalized sense. On the syntactic side, the Chamorro passive is essentially identical to its English counterpart, the differences following from independent differences in how the two languages express their surface subjects and objects (Chamorro has