

The Mirror Principle and Morphosyntactic Explanation

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

Many people have influenced the final form of this article, helping me with their comments, criticisms, and encouragement at various stages. Notable among them are J. Bresnan, N. Chomsky, K. Hale, P. Kiparsky, B. Levin, A. Marantz, D. Massum, and R. Sproat. I am grateful to D. Perlmutter and the ever-present anonymous LI reviewer for their extensive comments on an earlier version, which led to clarification of several key points. Special thanks go to S. J. Keyser, my consultant on all matters of form as well as content, and to audiences at MIT and the University of Massachusetts at Amherst for their responses to this material. Most of this work was done while I was supported by a National Science Foundation fellowship for graduate study.

¹ Glosses follow these conventions: Person-number agreement morphemes are indicated by Arabic numerals for person (1, 2, or 3), *s* or *p* for singular or plural, and *S* or *O* for subject or object. Simple number

- (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.
 lsS-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_j is causing them_i to beat each other_i.'

agreement is marked *sg* or *pl*. Grammatical function changing rules (GF-changing rules) are marked *pass* (passive), *caus* (causative), *refl* (reflexive), and so on. Other glossed morphemes are generally aspect/tense/mood markers and roughly follow the conventions of their sources. Transcriptions also follow the sources, except that certain diacritics, tone markers, etc., are occasionally suppressed.

² The *m/f* alternation here is part of a more general alternation, which, roughly speaking, is morphologically governed by the mood of the verb form (realis with *m* and irrealis with *f*).

- 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?

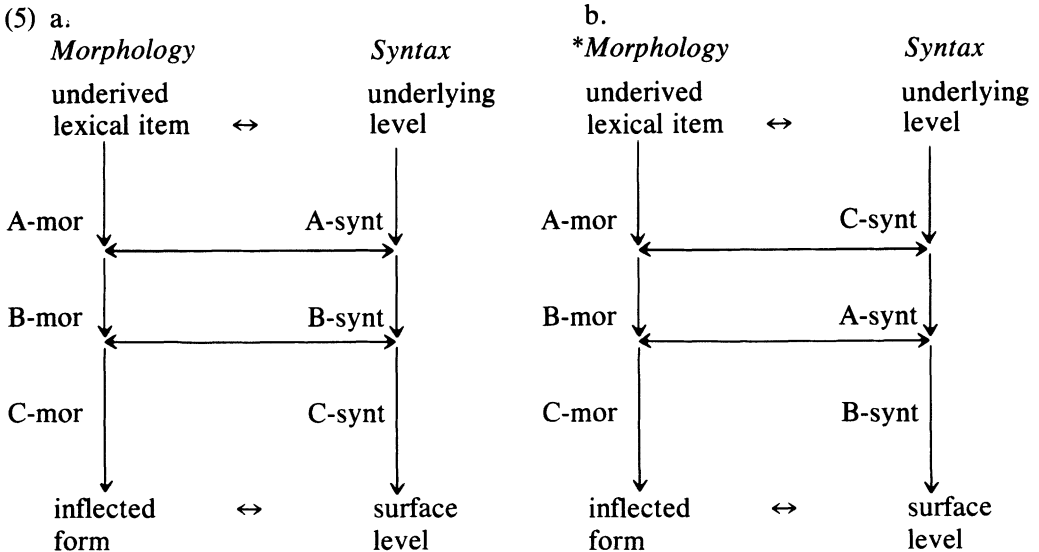
Once again, the key is the morphological structure of the two verbs involved—in particular, the relative order of the causative and reciprocal morphemes. In (3a), where the reciprocal binds the object to the underlying subject, the reciprocal morpheme is inside the causative morpheme, that is, closer 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. Sections 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]

³ In fact, one can take these representations as variables over theories to some degree; add your favorite theoretical assumptions and out comes a version of your syntactic theory to a significant extent.

⁴ In spite of this, in some languages, derivation and inflection may be done in different morphological “strata,” and certain morphophonological differences will follow from this.

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),

⁵ Another assumption is implicit here and in what follows: that “morphological process” is basically equivalent to “adding a prefix or suffix” (plus doing concomitant phonology). This assumption is true for an important subset of languages of the world—namely, those known as “concatenative” or “agglutinative”—but not for all. I will keep this as a simplifying assumption, and will return to discuss its status in detail in section 5.

⁶ Again, the sense of “before” intended here is not necessarily a temporal one, but that is by far the easiest way to talk, and I will continue to do so, both in morphology and in syntax.

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

⁷ This level, referred to as “semantic” or “underlying,” factors out the essential core of D-structure from Government-Binding Theory, the initial stratum from Relational Grammar, “basic” lexical forms (= lexical forms not sanctioned by lexical rules) in Lexical Functional Grammar, logico-semantic structure in the theory of Marantz (1981), etc.

⁸ This surface level factors out the essential core of S-structure from Government-Binding Theory, the final stratum from Relational Grammar, lexical forms (in general) from Lexical Functional Grammar, etc.

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

¹³ One example of a marked case of agreement apparently comes from Quechua. In this language, the so-called object agreement is not sensitive to grammatical functions at all. Instead, it agrees with the most prominent, animate NP in the VP, whatever its function (Muysken (1981), Adelaar (1977)).

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.
 lsS-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 I [= subject] of the clause is plural" (p. 25). In our terms, this can be represented as follows:

- (16) *Number Agreement (Chamorro)*
 NPI VERB . . . → NPIⁱ VERBⁱ . . .
 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 infixes 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 VSO word order, with optional fronting of the subject; English is SVO, etc.). Hence, the rule schema in (12) can be used here as well. A typical example of an active-passive pair in Chamorro is given in (17):

- (17) a. Si Juan ha#dulalak si Jose.
 PN Juan 3sS-follow SN Jose
 'Juan followed Jose.'
 b. D-in-ilalak si Jose as Juan.
 pass-follow PN Jose obl Juan
 'Jose was followed by Juan.'

(iii) Causative. Morphologically, the Chamorro causative is derived simply by prefixing *na'*-. Syntactically, Gibson (1980) provides extensive evidence that the causative

produces three changes in grammatical functions: a new NP argument (the ‘causer’) is added as the subject; the (old) subject becomes the object; and, if the verb was transitive, the object becomes oblique.¹⁴ In our notation:

- (18) *Causative (Chamorro)*
 NP1 V (NP2) . . . → NP3 V NP1 (NP2) . . .
 subj obj subj obj obl

Typical examples of causative sentences are given in (19) with an intransitive verb root, and in (20) with a transitive verb root:

- (19) Ha#na'-maipi si Maria i hanum.
 3sS-caus-hot PN Maria the water
 ‘Maria heated the water.’
 (20) Ha#na'-taitai ham i ma'estru ni esti na lebblu.
 3sS-caus-read 1pex-obj teacher obl this book
 ‘The teacher made/let/had us read this book.’

Turning now to more complex examples, let us consider the passive sentence (15b). Given the reasoning from section 2.1, the morphological structure of the verb must be as in (21), which implies that the passive morpheme is added before *fan-*.¹⁵

- (21) [. . . [fan [in [saolak]]]]
 pl pass spank

Now the Mirror Principle comes into play, requiring in this situation that the syntactic effects of Passive must happen before the syntactic coindexing associated with *fan-* is done. In other words, the syntactic derivation must be (22a) and not (22b):

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Passive | | NP2 | VERB ⁱ | NP1(pl) ⁱ | subj | | obl |
| NP1 | VERB | NP2(pl) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| subj | | obj | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ↓
Passive | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NP2(pl) | VERB | NP1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| subj | | obl | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ↓
<i>fan-</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NP2(pl) ⁱ | VERB ⁱ | NP1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| subj | | obl | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NP1(pl) | VERB | NP2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| subj | | obj | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ↓
<i>fan-</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NP1(pl) ⁱ | VERB ⁱ | NP2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| subj | | obj | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ↓
Passive | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NP2 | VERB ⁱ | NP1(pl) ⁱ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| subj | | obl | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

¹⁴ From the point of view of Gibson’s analysis (and many others) there is an equivocation here. These analyses postulate an initial biclausal structure for causatives, which collapses into a monoclausal structure at some point. In these terms the left-hand side of the causative relation (18) is the initial lower clause structure, and the right-hand side is the final merged clause structure. For current purposes I want to abstract away from the details of any particular analysis, and I will focus at both levels on the verb root that is affixed.

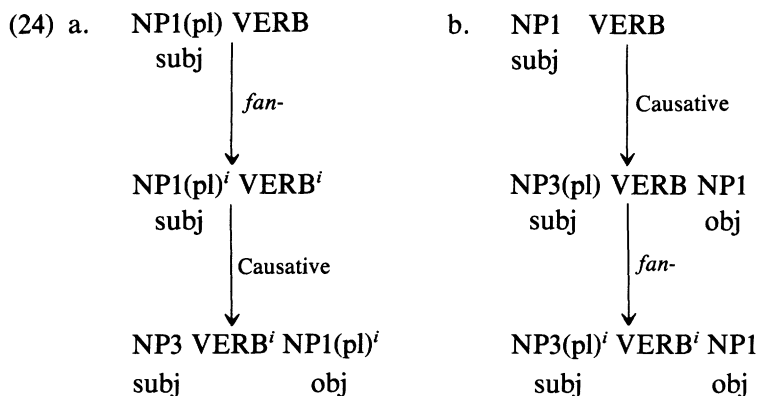
¹⁵ The justification for treating the infix as a prefix in this position will be given more fully in section 5.

Hence, Passive must “feed” Number Agreement, which can only register derived subjects in this case.

The same considerations apply to the causative example (15c), but the conclusion is the opposite. This time *fan-* occurs closer to the verb than the GF-rule morpheme does, so it must be added first in the morphological derivation:

- (23) [. . . [na' [fan [otchu]]]]
 caus pl eat

Therefore, by the Mirror Principle, the coindexing associated with Number Agreement must be effected before the GF-changes associated with Causative. Thus, the syntactic derivation must be (24a) and not (24b):

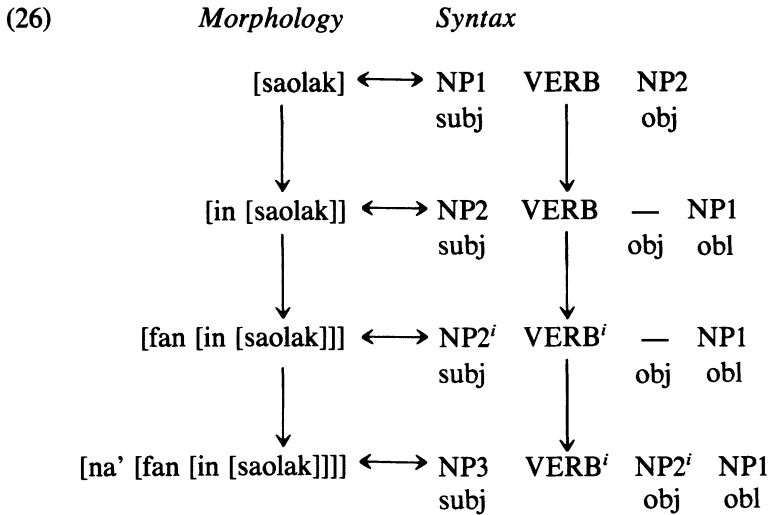


Hence, this time Number Agreement can only register the plurality of the underlying subject and not the plurality of the derived subject.

In fact, these analyses can be combined to explain a still more complicated example. Consider (25), which is the causative of a passive:

- (25) Hu#na'-fan-s-in-aolak i famagu'un gi as tata-n-niha.
 1sS-caus-pl-pass-spank children obl father-their
 'I had the children spanked by their father.'

Here *fan-* can only be registering the plurality of ‘the children’, since this is the only plural nominal in the sentence. Yet this nominal is neither the semantic subject nor the surface subject of the verb. It would, however, be an intermediate subject: the subject after Passive has applied but before Causative has. And, not surprisingly, *fan-* appears between the two GF-rule morphemes in the morphological structure, exactly as required by the Mirror Principle. The parallelism between the syntactic and morphological derivations is diagrammed in (26). If the relative order of some process on one side of this diagram were changed while holding the other side constant, the structure would be ungrammatical by the Mirror Principle.



In conclusion, we have been able to account for complex interactions of processes in terms of independent properties of these processes plus a simple constraint on how they are combined: namely, we have explained the apparent idiosyncrasies of *fan*-agreement in Chamorro in terms of the very general Mirror Principle, plus the independently observable facts about where the *fan*-morpheme itself appears relative to other verbal affixes.¹⁶

3.2. A Universal Restriction on Agreement Processes

Given this explanation for language-particular facts about agreement in Chamorro, the next question is: How general is this account? Is the Mirror Principle a peculiarity of Chamorro, or is it a principle of Universal Grammar? This subsection will explore these questions by examining agreement behaviors in other morphologically complex languages.

A striking thing about Chamorro's *fan*-agreement is its rarity; clear examples of agreement morphemes that can appear intermixed with GF-rule morphemes seem quite unusual. This does not mean, however, that the Mirror Principle has nothing to say about agreement in other cases; only that the range of examples from any one language will be less compelling. Nevertheless, predicting overall trends drawn from a range of languages has a deeper compulsion of its own.

Suppose that the Mirror Principle is part of Universal Grammar. Then the reasoning in section 3.1 concerning the syntactic behavior of *fan*- as a function of its position relative to GF-rule morphemes will hold true in the general case. Thus, if any agreement

¹⁶ In fact, the derivations in (22b) and (24b) are ruled out for an independent reason—the condition that *fan*- appears only on intransitive verbs. Thus, perhaps it is more insightful to start from the two possible syntactic derivations and use the Mirror Principle to derive the morpheme orders instead of the other way around. The situation is symmetrical.

morpheme X is closer to the verb root V than a GF-rule morpheme Y, then X must be attached to V before Y is (by cyclicity), and by the Mirror Principle the agreement relation between V and its NP will be established before the grammatical functions are changed. Therefore, X will uniformly express agreement with underlying (semantic) grammatical functions. Similarly, if X is farther from V than Y is, then by the Mirror Principle the grammatical functions will be changed before the agreement relation is established, and X will uniformly express agreement with surface grammatical functions. Thus, there are two aspects to any structure that involves both agreement and a GF-rule: the relative position of the two affixes involved, and whether the agreement references underlying or surface grammatical relations. A priori, these two aspects could vary independently of each other, but the Mirror Principle claims that they cannot. Of the four logical possibilities for combining these two aspects in a single structure, it predicts that only two will be attested in natural language. This is represented in (27), where the permitted combinations are marked + and the prohibited ones *.

(27)	<i>Syntax</i>	<i>Morphology</i>
a.	+ agreement with semantic GFs	agreement is closer to V
b.	* agreement with semantic GFs	GF-morpheme is closer to V
c.	* agreement with surface GFs	agreement is closer to V
d.	+ agreement with surface GFs	GF-morpheme is closer to V

In testing whether this restriction induced by the Mirror Principle is correct cross-linguistically, we find first that pattern (27d)—surface agreement morphemes farther out from the verb root—is by far the most common among languages of the world. For example, in addition to the rather limited number agreement discussed in section 3.1, Chamorro has a fuller paradigm of person-number agreement, which is related to the tense-aspect system of the language. Gibson (1980) records the following forms:

(28)	<i>Realis</i>		<i>Irrealis</i>	
	sing.	pl.	sing.	pl.
1	hu	ta (incl) in (excl)	(bai)u	(u)ta (incl) (bai)in (excl)
2	un	in	un	in
3	ha	ma	u	u(ma)

These morphemes attach to the beginning of the verb.¹⁷ They always come before (outside) the GF-rule prefixes and refer exclusively to surface grammatical relations, as in the forms cited in section 3.1 and in (29):

- (29) a. I famagu'un ma#dulak si Jose.
 the children 3pS-follow PN Jose
 'The children followed Jose.'

¹⁷ In realis clauses, verbs show subject agreement only when they are transitive.

- 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 will be spanked by their father.'
- c. Hu#na'-podding i bola.
 lsS-caus-fall the ball
 'I let the ball fall.'

(29a) is a simple example of this kind of subject agreement; (29b) and (29c) show these agreement markers occurring outside the passive morpheme and the causative morpheme, respectively. In each case, agreement is with the surface subject. In this connection, consider again example (15c) (repeated here):

- (30) Hu#na'-fan-otchu siha.
 lsS-caus-pl-eat them
 'I made them eat.'

This sentence contains two agreement morphemes (*fan-* and *hu-*), both of which must generally be analyzed as subject agreement morphemes (see for instance (29b)). Yet here the two disagree in features: *fan-* is plural, whereas *hu-* is singular. The reason for this mismatch is by now familiar: *fan-* agrees with the underlying subject, whereas *hu-* agrees with the surface subject, and these two are not the same. The only construction in which the two morphemes can conflict in this way is the causative construction, and the causative morpheme is the only GF-rule morpheme that can appear between the two. Once again, this follows from the Mirror Principle. Similar agreement patterns are found in Turkish, Sanskrit, and Quechua, except that in these languages the relevant morphemes are suffixes rather than prefixes.¹⁸

Not all natural language agreements can be interpreted as instances of pattern (27d), however. One that cannot is found in Achenese, an Austronesian language described in part by Lawler (1977). Consider the following active-passive pairs (where (o) = *older* and (y) = *younger*):

- (31) a. i. Gəpnyan ka gi-cəm lon.
 she(o) perf 3(o)-kiss me
 'She (older) already kissed me.'
- ii. Lon ka gi-cəm le-gəpnyan.
 me perf 3(o)-kiss by-her(o)
 'I have been kissed by her.'
- b. i. Drən ni-pajoh bəh-mamplam.
 you(o) 2(o)-eat fruit-mango
 'You ate the mangoes.'

¹⁸ An even more common morpheme pattern is "agr-verb-pass," where the agreement is with the surface (derived) subject. This is consistent with the Mirror Principle, as long as we claim that the morphological structure of the verb is [agr [[verb] pass]], a structure that we might expect to be confirmed by the phonology in some languages. The Bantu languages cited in the next section show this pattern.

- ii. Bəh-mamplam ni-pajoh le-drən.
 fruit-mango 2(o)-eat by-you(o)
 'The mangoes were eaten by you.'

Lawler argues that the (ii) sentences are produced by a GF-changing rule of passive, rather than by a "pure" topicalization rule that does not change grammatical functions. In particular, he shows that the preverbal semantic object in these sentences behaves like a surface subject in that it can be raised or controlled if the sentence is embedded under an appropriate matrix predicate:

- (32) Uring agam nyan ji-utaha gi-pireta le-dəʔto.
 person male that 3(y)-try 3(o)-examine by-doctor
 'That man (younger) tried to be examined by the doctor (older).'

Furthermore, Lawler shows that the semantic subject cannot appear postverbally in a *le*-phrase when oblique nominals are fronted under topicalization, but only when there is a semantic object present to undergo passivization:

- (33) a. Ngən-moto uring agam nyan ji-jaʔ tikula.
 with-car person male that 3(y)-go school
 'With the car, that man went to school.'
 b. *Ngən-moto ji-jaʔ tikula le-uring agam nyan.
 with-car 3(y)-go school by-person male that

Now we observe that in the active sentences (31ai–bi), the verbal agreement morpheme references the NP in the subject position. In their passive counterparts, however, the agreement morpheme agrees not with the subject NP, but with the NP in the postverbal *le*-phrase. Thus, Achenese verbal agreement is unaffected by passivization. Given our assumption that an agreement relation must be uniform at the point where it is established, we conclude that Achenese shows agreement with underlying (i.e. semantic level) subjects. Now, if Achenese had a passive morpheme that appeared closer to the verb than this agreement morpheme does, it would be an instance of pattern (27b), falsifying the Mirror Principle. In fact, the Mirror Principle is not falsified, because Achenese has another unusual property—it has no (overt) passive morphology.

A somewhat different kind of example is provided by Huichol, a Uto-Aztecan language described by Comrie (1982). Many of the transitive verbs in this language show suppletion determined by the number of their direct objects. For example, the Huichol expression for 'to kill' involves two phonologically unrelated stems: *-mie*, used with singular direct objects, and *-qii*, used with plural direct objects. This is illustrated in (34):

- (34) a. Wan maria naa-ti me-meci-mieni.
 Juan Maria and-subj 3pS-1sO-kill/sg
 'Juan and Maria are killing me.'
 b. Nee wan maria naa-me ne-wa-qii.
 I Juan Maria and-obj 1sS-3pO-kill/pl
 'I am killing Juan and Maria.'

Now suppose we give an analysis of this kind of suppletion that assimilates it to the more general case of object agreement. This can be accomplished by saying that a form like *-mie* is, in effect, both a verb root and a singular object agreement morpheme simultaneously. Then, whenever this verb root is present in a structure, it must be co-indexed with its direct object, where this relation is interpreted as meaning that the two agree in number. In the same way, *-qii* is both a verb root and a plural object agreement morpheme. Then, this analysis of suppletion implies that no GF-rule morpheme in Huichol can be attached to the verb before this “agreement morpheme,” because the agreement morpheme is the verb root itself. This means that the verbal suppletive form must always be determined by the semantic level object—otherwise Huichol would constitute an instance of pattern (27c), and again the Mirror Principle would be falsified.

Huichol has a GF-rule that changes the object function in a way that is relevant to checking this prediction—namely, Benefactive, which is basically a productive version of English “Dative Shift.”¹⁹ Morphologically, Benefactive adds the suffix *-(r)i*, and syntactically, it introduces a new NP bearing a benefactive semantic role as direct object, moving the old direct object into a “second” or indirect object position. This can be represented as follows:

(35) *Benefactive*

NP1	VERB	NP2	→	NP1	VERB	NP3	NP2
subj		obj		subj		obj	i-obj

Thus, in a benefactive construction sentence, the underlying semantic object is not the same as the surface object. Sentences (36a–b) show that verbal suppletion is determined uniformly by the underlying direct object, and not by the surface direct object, in consonance with the Mirror Principle:²⁰

- (36) a. Nee waakana ne-mec-umi?ii-ri eeki.
 I chicken 1sS-2sO-kill/sg-ben you
 ‘I killed you (sg) the chicken.’
- b. Nee waakana-ari ne-mec-uqi?ii-ri eeki.
 I chicken-pl 1sS-2sO-kill/pl-ben you
 ‘I killed you (sg) the chickens.’

(36b) is identical to (36a), except that the number of the patient NP ‘chickens’ (= underlying object) is changed from singular to plural, and along with this the verb stem obligatorily changes from its singular form to its plural form. Note in particular that the benefactive direct object ‘you’ remains singular in both sentences. We know that the benefactive nominal is the surface direct object in these sentences, because it is referenced by the normal person-number object agreement prefix *mec-*, and because it alone

¹⁹ This benefactive construction is a special case of an “applicative” construction. These will be discussed at greater length in section 4.2.

²⁰ There are some unglossed morphemes in all the Huichol examples. These are mostly distributive markers of various kinds and can be safely ignored (see Grimes (1964)).

can become the subject under passivization, as illustrated in (37):

- (37) a. Eeki waakana pe-peumi[?]-i-yeri.
 you chicken 2sS-kill/sg-ben-pass
 ‘You were killed a chicken.’
 b. Eeki waakana-ari pe-peuqi[?]-i-yeri.
 you chicken-pl 2sS-kill/pl-ben-pass
 ‘You were killed (some) chickens.’

In fact, the existence of the object agreement prefix means that many Huichol sentences show the number of their objects twice: once via suppletion and once via person-number agreement. In simple sentences these two must always agree in number, as they do in (34a–b). When the benefactive suffix is added, however, the two can disagree, as they do in (36b). Given the Mirror Principle, this follows, assuming that the morphological structure of the verb in (36b) is as follows:

- (38) [ne [mec [[uqi[?]ii] ri]]
 S-agr O-agr V/agr ben

Furthermore, the Mirror Principle predicts that in no language will an object prefix and a verbal suppletion disagree in the opposite way, such that the suppletion registers the number of the surface object, while the affix registers the number of the semantic object. Once again, the Mirror Principle seems to restrict the number of grammatical systems in such a way that all and only the attested situations are permitted.

To summarize: As represented in (27), the Mirror Principle predicts that, of four conceivable morphosyntactic relationships between agreement and GF-rules, the languages of the world will attest only two. Of the two allowed patterns, one (namely, (27d)) is quite common and is manifested in languages as diverse as Chamorro, Turkish, Sanskrit, and Quechua, while data from Achenese agreement and Huichol verb suppletion are consistent with the other (namely, (27a)). Chamorro *fan-* agreement shows both of these patterns in different constructions. Finally, I have been able to find no clear case of the disallowed patterns in (27b) and (27c). This supports the claim that the Mirror Principle, or more precisely the generalization described by the Mirror Principle, must be a consequence of Universal Grammar.

4. Interactions between GF-Rules and More GF-Rules

Section 4.1 returns to the second body of facts that motivated the Mirror Principle—the interpretation of reflexive-causative sentences in Quechua—to show how they can be explained. Once again, the explanation will generalize across languages and across constructions. Thus, section 4.2 will show how the same concepts can account for interactions between passives and applicatives as well.

4.1. Causatives and Reflexive-Reciprocals

Consider again the following sentences from Quechua (given earlier in (3)):

- (39) a. Maqa-naku-ya-chi-n.
 beat- recip-dur-caus-3S
 'He_j is causing them_i to beat each other_i.'
- b. Maqa-chi-naku-rka-n.
 beat-caus- recip-pl-3S
 'They_j let someone_i beat each other_j.'

In section 1 we saw that although essentially the same morphemes appear in the verb forms in (39a) and (39b), the interpretations of the two sentences are quite different. Thus, in (39a) the beaters and those who are beaten are taken to be the same, whereas in (39b) it is the instigators of the beating and those who are beaten that are the same, while someone else is the beater. We also saw that this difference correlates with a difference in morphological structure: in (39a) the reciprocal *-naku* precedes the causative *-chi*; in (39b) the causative comes first. Moreover, there is reason to think that this correlation is general, since Quechua reflexives show exactly the same interactions with the causative that the reciprocals do:

- (40) a. Maqa-ku-ya-chi-n.
 beat-refl-dur-caus-3S
 'He_j is causing him_j to beat himself_j.'
- b. Maqa-chi-ku-n.
 beat-caus-refl-3S
 'He_j lets someone_j beat him_i.'

This correspondence was our second motivation for introducing the Mirror Principle, which directly relates morphological structure and syntactic structure. We have seen how this principle works to determine properties of agreement systems; now we see how it can be applied to explain these interactions among GF-rules, again given an understanding of how they work in isolation.

First let us consider Quechua causatives, such as (41a–b) from Parker (1969):

- (41) a. Punu-ra-chi-saq wawa-ta.
 sleep-cont-caus-1S baby-acc
 'I'll put the baby to sleep.'
- b. Manuku-wan nuqa-ta maqa-chi-ma-n.
 Manuel-instr I-acc beat-caus-1(O)-3S
 'He caused Manuel to beat me.'

In both sentences the causer appears as the surface subject. In (41a), where an initially intransitive verb is the input to Causative, the verb's semantic subject becomes the surface object; in (41b), which is built from an initially transitive verb, the semantic object (= patient) remains the object and the semantic level subject becomes an oblique phrase. These grammatical relation assignments can be seen from the patterns of case-marking and agreement in these two sentences. Hence, we can represent the syntactic

component of Quechua causativization as follows:

(42) *Causative (Quechua)*

- a. NP1 VERB \emptyset . . . \rightarrow NP3 VERB NP1 . . .
 subj obj subj obj
- b. NP1 VERB NP2 . . . \rightarrow NP3 VERB NP2 NP1 . . .
 subj obj subj obj obl

The morphological component of Quechua causatives consists of simply suffixing *-chi*.

Examples of Quechua reflexives and reciprocals (from Parker (1969)) are given in (43):

- (43) a. Riku-ku-n.
 see-refl-3S
 ‘He sees himself.’
- b. Riku-naku-nku.
 see-recip-3pS
 ‘They see each other.’

Morphologically, Reflexivization and Reciprocal Formation consist of adding to the verb the suffixes *-ku* and *-naku*, respectively. Syntactically, both processes involve establishing a binding relation between the underlying object role and the underlying subject role. This occurs such that only one of these grammatical functions can be represented by an overt nominal, while the other role is interpreted as being referentially dependent on the first. Verbal morphology indicates that the remaining nominal is a surface subject, but I will follow the analysis of Marantz (1981) and assume that it is an underlying object. On this view, Reflexivization and Reciprocal Formation consist of two subprocesses: binding the subject role to the object and making the object become the new subject. This situation can be represented as follows:

(44) *Reflexivization–Reciprocal Formation*

- NP1 VERB NP2 . . . \rightarrow NP2 VERB — . . .
 subj obj subj obj
- (NP2 = NP1)

This analysis captures the fact that reflexive verb forms can often have a “mediopassive” reading, where the surface subject is interpreted as the semantic object but not as the semantic subject. In this case the GF-changing subpart of Reflexivization is maintained, but the role-binding subpart is suspended.²¹

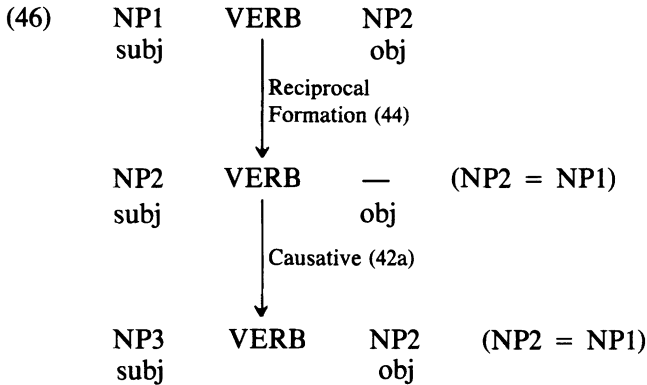
We are now ready to return to the more complex examples given in (39) and (40).

²¹ In fact, this analysis is not crucial to what follows. The only necessary properties of the reflexive-reciprocals are that they involve the subject and object grammatical functions and that they make intransitive verb forms. This is equally consistent with an analysis that simply binds the object role to the subject, removing the object NP.

Take first the morphological structure of the verb in (39a), which, given our assumptions from section 2.1, must be as follows:

(45) [[[[[maqa] naku] ya] chi] n]

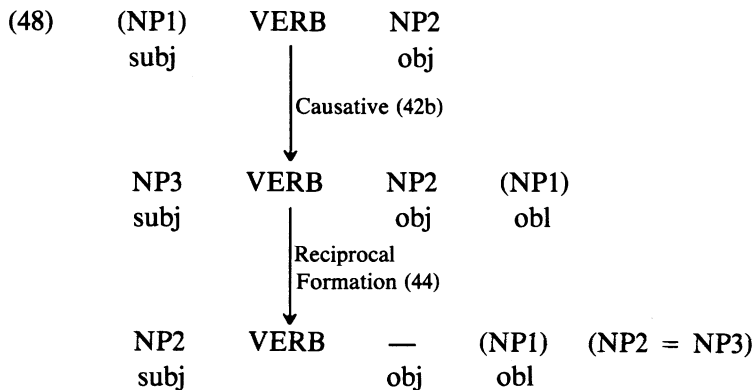
In other words, the reciprocal *-naku* must have been added before the causative *-chi*, since it is closer to the verb stem *maqa*. The Mirror Principle then implies that the syntactic components of these processes must apply in the same order: Reciprocal Formation first, then Causative. This gives the following derivation:



Here the initial agent and the patient are taken to be referentially dependent, which is the correct interpretation for (39a). In the morphological structure for (39b), on the other hand, *-naku* and *-chi* appear in the opposite order relative to the verb stem, implying that this time the causative morphology is done prior to the reciprocal morphology:

(47) [[[[maqa] chi] naku] rka + n]

By the Mirror Principle, what is true of the morphology is true of the syntax as well, requiring this derivation:



This time the causer and the initial patient are taken as being referentially dependent, which is the correct interpretation for (39b). The difference stems from the fact that in

the second example (but not the first) the causative process modifies the subject and object grammatical functions before Reciprocal Formation links the two. Thus, the two roles linked are different in the two cases. Furthermore, this difference in order of application is obligatorily reflected as a difference in morpheme orders. Thus, the Mirror Principle explains why a difference in interpretation corresponds to a difference in morpheme order. Moreover, it explains why each ordering corresponds to the particular interpretation that it does, rather than the other way around, by making reference to independently motivated properties of the processes involved. The reflexive-causative sentences in (40) are accounted for in exactly the same way; the only difference comes in how the referential dependency “NP_x = NP_y” is interpreted.

Now consider the following sentence pair from Bemba, a Bantu language (data from Givón (1976)):

- (49) a. Naa-mon-an-ya Mwape na Mutumba.
 1sS-past-see-recip-caus Mwape and Mutumba
 ‘I made Mwape and Mutumba see each other.’
- b. Mwape na Chilufya baa-mon-eshy-ana Mutumba.
 Mwape and Chilufya 3pS-see-caus-recip Mutumba
 ‘Mwape and Chilufya made each other see Mutumba.’

These examples are very much like the Quechua examples in two ways: they include reciprocal and causative in the same sentence, and a difference in the order of morphemes corresponds to a difference in interpretation. However, the interpretations involved are slightly different. (49a) links initial agent to initial patient just as in the corresponding (39a); but (49b) links the causer to the initial agent, rather than to the initial patient as in (39b).

This difference between Quechua and Bemba can be simply reduced to an independent difference between the two languages. It has become clear in recent years that there are two distinct types of morphological causatives, which differ most saliently in their treatment of the initial agent argument of transitive verb roots (Gibson (1980), Marantz (1981)). We have already seen both types here: one is the Quechua type (42), where the underlying subject becomes oblique if there is an object; the other is the Chamorro type (18) (repeated here as (50)), where the underlying subject always becomes the surface object, and the underlying object becomes oblique:

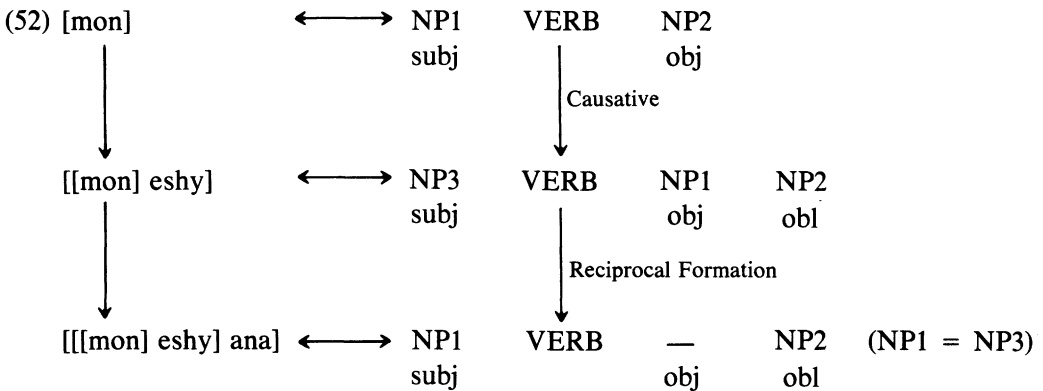
- (50) *Causative (Chamorro)*
 NP1 VERB (NP2) . . . → NP3 VERB NP1 (NP2) . . .
 subj obj subj obj obl

Now, (51) gives evidence that the Bemba causative is of the Chamorro type, rather than the Quechua type.²²

²² Givón (1976) speculates that (51a) is not fully natural because of limitations on the number of postverbal NPs that can appear without overt case-marking in the language.

- (51) a. ?Naa-mon-eshya Mwape Mutumba.
 1sS-see-caus Mwape Mutumba
 'I made Mwape see Mutumba.'
 b. Mwape aa-mon-eshy-wa Mutumba na ine.
 Mwape 3sS-see-caus-pass Mutumba by me
 'Mwape was made to see Mutumba by me.'

In (51a) the initial agent *Mwape* is in the immediate postverbal position characteristic of direct objects in Bemba, whereas the patient *Mutumba* is not; in (51b) this same initial agent becomes the subject under passivization, whereas again the patient does not. Now, since Bemba's causative is different from Quechua's, a different configuration of grammatical functions will be presented to the Reciprocal rule in (49b), where—by morphology plus the Mirror Principle—Causative precedes Reciprocal. Hence, the derivation for (49b) is as follows:



Here the causer and the initial agent are interpreted as referentially dependent, which is correct. Meanwhile, in (49a), where Reciprocal must precede Causative, there is no difference between Bemba and Quechua, because Reciprocal creates intransitive forms and the two Causative rules treat intransitive verbs the same. Once again, the Mirror Principle helps to explain the interactions of processes in terms of their properties in simple sentences, this time in a way that solves a problem of comparative linguistics.

4.2. *Passives and Applicatives*

We have seen that the Mirror Principle, taken as a general principle of Universal Grammar, has implications that reach beyond the language-particular facts of Chamorro number agreement that initially suggested it. The same is true of its implications for the possible interactions of GF-rules. This section will further illustrate the scope (and validity) of the Mirror Principle, by looking at a case unrelated to the causatives and reciprocals of section 4.1.

Consider the two GF-rules Passive and Applicative. These two have a crucial common point: they both involve the direct object grammatical function. Passive takes the

direct object of a structure and makes it the subject. “Applicative” creates new direct objects that have semantic roles that are usually associated with objects of prepositions or semantic case nominals in languages like English (see Marantz (1981; 1982), as well as references to specific languages cited below).²³ The most common semantic role in these constructions is benefactive, closely followed by goal and instrument. Within this core context, languages vary to some degree in the exact treatment of the “old” direct object, and in whether or not the semantically oblique nominal can (optionally) be expressed as the object of a preposition rather than as a direct object. These rules can be expressed as follows:

(53) *Applicative*

NP1 VERB NP2 (NP3) . . . → NP1 VERB NP3 NP2
 subj obj obl subj obj xxx

Intuitively, this rule is a productive, affix-associated version of English Dative Shift. Notice that the Huichol Benefactive in (35) is simply a special case of this schema. It can be illustrated by the following sentence pair from this language (from Comrie (1982)):

- (54) a. Zeeme nawazi ze-puunanai.
 you-pl knife 2pS-buy
 ‘You all bought a knife.’
 b. Eeki nawazi tiiri pe-wa-rutinanai-ri.
 you-sg knife children 2sS-3pO-buy-ben
 ‘You bought the children a knife.’

The applicative sentence (54b) differs from the plain sentence (54a) in two major ways: the verb form contains the *-ri* suffix, and the sentence contains an extra NP ‘the children’, which is interpreted as a beneficiary of the action. Note that this nominal triggers Object Agreement on the verb.

Now, these applicative rules create new direct objects, whereas the passive makes direct objects into subjects. Therefore, these rules potentially interact in interesting ways. In particular, an applicative rule can apply so as to “feed” Passive. In that case the final subject of the sentence will bear the “oblique” semantic role associated with the applied affix, rather than the patient semantic role usual in a passive sentence. The Mirror Principle makes a clear prediction about the morphological structure of the verb in such a sentence: since syntactically Applicative applies before Passive, and morphological derivations must directly reflect syntactic derivations, it predicts that the applied affix must appear closer to the verb than the passive affix does in these situations. This prediction is confirmed in many languages. Thus, (55) is the passive of the Huichol applicative structure given in (54b):

- (55) Tiiri yi-nauka-ti nawazi me-puutinanai-ri-yeri.
 children four-subj knife 3pS-buy-ben-pass
 ‘Four children were bought a knife.’

²³ These are often called “oblique to 2 advancement” and “3 to 2 advancement” in Relational Grammar.

Here the beneficiary ‘four children’ has become the subject, as shown by the morphology on the quantifier and by the subject agreement on the verb. Moreover, the benefactive applied suffix *-ri* precedes the passive suffix *-yeri* and thus is closer to the verb, in accordance with the Mirror Principle (see also (37)).

The Bantu language Chi-Mwi:ni shows exactly the same pattern (from Kisseberth and Abasheikh (1977)):

- (56) a. Nu:ru \emptyset -chi-tes-ete chibu:ku.
 Nuru SP-OP-bring-asp book
 ‘Nuru brought the book.’
- b. Nu:ru \emptyset -m-tet-el-ele mwa:limu chibu:ku.
 Nuru SP-OP-bring-appl-asp teacher book
 ‘Nuru brought the book to the teacher.’
- c. Mwa:limu \emptyset -tet-el-el-a chibu:ku na Nu:ru.
 teacher SP-bring-appl-asp-pass book by Nuru
 ‘The teacher was brought the book by Nuru.’
- d. *Chibu:ku chi-tet-el-el-a mwa:limu na Nu:ru.
 book SP-bring-appl-asp-pass teacher by Nuru
 ‘The book was brought the teacher by Nuru.’

(56a) is a plain transitive sentence, and (56b) is an applicative version of it, where the suffix *-el* is added to the verb form and a goal nominal ‘the teacher’ appears. (56c) is a passive version of (56b), where this goal nominal has become the surface subject. Once again the passive suffix *-a* appears outside of the applied suffix, as predicted. If it were acceptable, (56d) would be a counterexample to the Mirror Principle: in this structure Applicative must precede Passive morphologically, because its morpheme is closer to the verb root; yet Passive must precede Applicative syntactically, because the underlying object (= patient) is mapped into the surface subject slot rather than the derived object (= goal). This sentence is not acceptable, however, correctly ruled out by the Mirror Principle, and by no other principle of the grammar.

A third and final illustration of the interactions between passives and applicatives comes from another Bantu language, Kinyarwanda, as described by Kimenyi (1980):

- (57) a. Umugabo a-ra-andik-a ibaruwa n’iikaramu.
 man SP-pres-write-asp letter with-pen
 ‘The man wrote the letter with the pen.’
- b. Umugabo a-ra-andik-iish-a ibaruwa ikaramu.
 man SP-pres-write-instr-asp letter pen
 ‘The man wrote the letter with the pen.’
- c. Ikaramu i-ra-andik-iish-w-a ibaruwa n’umugabo.
 pen SP-pres-write-instr-pass-asp letter by-man
 ‘The pen was written-with the letter by the man.’
- d. Ibaruwa i-ra-andik-iish-w-a ikaramu n’umugabo.
 letter SP-pres-write-instr-pass-asp pen by-man
 ‘The letter was written with the pen by the man.’

(57a–c) are directly analogous to the corresponding Chi-Mwi:ni sentences (56a–c), except that here the semantically oblique NP is an instrument, and in the “plain transitive” version (57a) this instrument is overtly expressed in a prepositional phrase. Note that again in (57c) the semantically oblique NP ‘pen’ has become the subject, and the passive morpheme *-w* appears outside the applied morpheme *-iish*, as predicted. This time, however, the (d) sentence of the paradigm is grammatical, apparently contradicting the Mirror Principle. This can be accounted for simply in terms of an independent difference between Kinyarwanda and Chi-Mwi:ni: in Kinyarwanda, Passive can make more than one unmarked postverbal NP into the subject, even in doubly transitive verbs that are not derived via Applicative.²⁴ This is illustrated in (58):

- (58) a. Umugabo y-a-haa-ye umugore igitabo.
 man SP-past-give-asp woman book
 ‘The man gave the woman the book.’
- b. Igitabo cy-a-haa-w-e umugore n’umugabo.
 book SP-past-give-pass-asp woman by-man
 ‘The book was given to the woman by the man.’
- c. Umugore y-a-haa-w-e igitabo n’umugabo.
 woman SP-past-give-pass-asp book by-man
 ‘The woman was given the book by the man.’

Thus, in Kinyarwanda, unlike Chi-Mwi:ni, the theme NP is still accessible to Passive even after Applicative has created a new direct object, and (56d) therefore is not a counterexample to the Mirror Principle. Once again, the properties of complex structures are explained by this principle combined with an understanding of the properties of simple structures. The same pattern of facts holds true for benefactive, manner, and goal applicative constructions in Kinyarwanda.

Looking at passive-applicative interactions more generally, I have found no language in which a semantically oblique nominal becomes the subject of the sentence, but the morphology on the verb has the form [[[verb-root] pass] appl]. Similarly, I have found no language in which the semantic object becomes the subject, but the morphology on the verb has the form [[[verb-root] appl] pass], except the Kinyarwanda case discussed above, where independent factors intervene. Hence, the Mirror Principle places a correct restriction on the class of possible languages in this area as well. This time, however, it does not explain the whole pattern by itself; there is a fourth case that is perfectly consistent with the Mirror Principle, but that nevertheless apparently does not occur. This is the case where the semantic object (patient) becomes the subject and the verb has the form [[[verb-root] pass] appl].

I suggest informally that this gap in the paradigm follows from an independent con-

²⁴ How to integrate this marked property of Kinyarwanda into grammatical theory is controversial. Gary and Keenan (1977) and Marantz (1981) claim that the marked property of Kinyarwanda is that it can have more than one direct object in a clause; on the other hand, Dryer (1983) argues that Kinyarwanda has only one direct object, but that rules such as Passive can exceptionally refer to indirect objects as well. Either account is adequate for our purposes.

straint on applicative constructions. Consideration of the class of semantic roles that are commonly made direct objects via Applicative reveals that they are all roles closely associated with agency (Fillmore (1968)). Hence, benefactives, goals, instruments, and manners are the common applied objects, and each of these expresses some kind of further information about the relationship between the agent and the action, be it the agent's motives for performing the action or methods for carrying it out. In contrast, other semantic roles such as sources do not in general seem to become applied objects. Given this, it is natural to require that a verb be "agentive" in some sense for an applicative process to take place. Now it is well known that Passive functions cross-linguistically to make sentences less agentive and more stative. Therefore, the suggested condition on applicatives would imply that it is impossible to "applicativize" a structure that has already been passivized.²⁵ This rules out the fourth case independently of the Mirror Principle. Then, in this context, we have an account of why Applicative must come before Passive syntactically, and the Mirror Principle makes a contribution by ensuring that this syntactic constraint is reflected in the morphology as well, thereby explaining why languages have the morpheme sequence "V-appl-pass" but not the sequence "V-pass-appl."

5. The Scope of the Mirror Principle

We have seen that the Mirror Principle, introduced to handle certain particular facts about Chamorro and Quechua, can also explain a variety of morphosyntactic interactions universally. Here we will briefly discuss two related areas that do not fall in the scope of the Mirror Principle as it now stands: clitics and nonconcatenative morphology.

The discussion of clitics can be introduced by way of an apparent counterexample to the Mirror Principle: locative applicative constructions in Kinyarwanda. Consider the following paradigm (from Kimenyi (1980)):

- (59) a. Umugabo y-oohere-je ibaruwa kw'iiposita.
 man SP-send-asp letter to-post-office
 'The man sent the letter to the post office.'
- b. Umugabo y-oohere-je-ho iposita ibaruwa.
 man SP-send-asp-loc post-office letter
 'The man sent the letter to the post office.'
- c. Iposita y-ooherej-w-e-ho ibaruwa n'umugabo.
 post-office SP-send-pass-asp-loc letter by-man
 'The post office was sent-to the letter by the man.'

In (59c) the locative nominal becomes the subject under passivization, yet the locative

²⁵ B. Levin (personal communication) has pointed out that this account makes the independent prediction that applicative processes will not apply to predicates that are "unaccusative" in the sense of Relational Grammar. A. Marantz (personal communication) claims that this prediction does not seem correct for Georgian, but there is independent evidence that applicatives play a somewhat unusual role in that language because of case-assigning requirements. The prediction is confirmed in Chichewa (S. Mchumbo (personal communication)).

affix appears after the passive marker, farther away from the verb root. Thus, the correspondence between the syntactic derivation and the morphological derivation required by the Mirror Principle and illustrated by Kinyarwanda's other applicative constructions seems to break down here. I take it to be no coincidence that Kimenyi also exhibits a number of other differences between locative applied constructions and other applied constructions. First, the locative applied affixes are the only applied affixes that are phonologically reduced forms of their corresponding prepositions. Second, the locative applied affixes do not appear just anywhere after the passive morpheme; they are crucially last in the verb's morphological structure, and the locative object must immediately follow this verb. Third, this applied "affix" can appear elsewhere in the sentence than at the end of the verb; it can optionally appear behind the locative object as well:

- (60) a. Umugore y-oohere-je-ho isoko umubooyi.
 woman SP-send-asp-loc market cook
 'The woman sent the cook to the market.'
- b. Umugore y-oohere-je isoko ho umubooyi.
 woman SP-send-asp market loc cook

All of these considerations point to an analysis of locative applied affixes that takes them not to be verbal affixes at all, but rather elements that are halfway between verbal affixes and full lexical items. In other words, they are clitics: elements whose distribution is (roughly speaking) fixed syntactically rather than morphologically, but which become part of a "host" word phonologically. Since their distribution is not fixed morphologically, they are strictly speaking not part of the morphological derivation of a form, and hence the Mirror Principle does not apply to them. For research aimed at establishing a clear distinction between concatenative, affixal morphology and cliticization, see Simpson and Withgott (1983).

The second area in which the Mirror Principle does not necessarily apply can be referred to generally as "nonconcatenative morphology." Thus, in outlining the morphological assumptions that underlie the Mirror Principle (section 2), we implicitly assumed that "morphological process" and "adding a prefix or suffix to a root" were coextensive notions. This is roughly true for an important subset of the languages of the world (those languages traditionally known as strictly "concatenative" or "agglutinative"), but not for all. Thus, there exist processes of umlaut, reduplication, infixation, and so on, which may be part of the morphology of a language, but which do not show up as nicely ordered morphemes. At a deeper level, there are languages that make extensive use of what can be called "nonconcatenative morphology" proper, where morphological elements seem to be merged together, so that they have discontinuous realizations. The Semitic languages are the most famous examples of this type (McCarthy (1979)). Finally, it is also possible that there exists a third kind of morphology, which can be called "template morphology" (Stanley (1969), Simpson and Withgott (1983)). This is associated with the following cluster of properties (adapted from Speas (1984)):

- a. The position of a given affix is generally rigidly fixed, with no more than a very limited recursion of affixes.
- b. “Derivational” and “inflectional” morphemes are interspersed, rather than showing the normal pattern of having inflectional morphology “outside” of derivational morphology.
- c. There are discontinuous dependencies between morphemes, in apparent violation of principles of morphological subadjacency or bracket erasure.

In view of these properties, such languages have been thought of as having verbs associated with a specified number of affix slots, all affixes being dropped into their particular slots in effect simultaneously (hence the name “template” morphology). Navajo is the most famous example of this type. Now, it is an open question whether these apparently different types of morphology can be reduced to one set of more fundamental principles or not. In particular, it is not known whether the second assumption in section 2.1—that morphology proceeds by doing one thing at a time to a basic stem—is true or not. If it does prove true, then the Mirror Principle may have strong consequences in these types of languages as well, requiring that syntactic processes occur in the same order as their corresponding morphological processes. The only difference would be that it would not be possible to get information about the order of these morphological processes from a superficial look at morpheme order; instead, more detailed morphophonological information would be needed. We have already seen a trivial example in which this kind of reasoning works: the passive infix *-in-* in Chamorro. Since it is clearly inserted inside a word, it is a priori possible that it is inserted after other prefixes are attached, so that the order of morphemes will not reflect the order of morphological derivation. However, looking at the properties of this infix shows that it is inserted in a uniform morphophonological environment: immediately after the first syllable onset of the form. Then, in a verb form like (61)

- (61) para#u#fan-s-in-aolak
irr-3pS-pl-s-pass-aolak

the correct morphophonological environment for placing *-in-* exists only before *fan-* is prefixed. Therefore, *-in-* must be infixed before *fan-* is prefixed. Thus, morpheme order strictly speaking does not give evidence regarding the order of morphological derivation in this case, but an understanding of the morphological processes involved does, and the Mirror Principle still requires that the syntactic derivation match. This yields the correct predictions discussed in section 2.1. On the other hand, it is possible that even this kind of “generalized cyclicity” will be inadequate to account for some languages, in which case the Mirror Principle will simply be vacuous in these languages. Therefore, whether nonconcatenative morphology and template morphology fall within the scope

of the Mirror Principle or not depends on the extent to which they can be unified with agglutinative morphology in general.^{26,27}

6. Theoretical Implications of the Mirror Principle

In section 1 it was observed that there is no a priori necessity for GF-rules and their morphological correlates to be identified in a deep way; it could be that the two kinds of processes happen more or less independently and are simply matched up at some point. However, assuming this to be the case, it has been shown that something more is needed: namely, the Mirror Principle, a stipulation requiring that the morphological derivations and the syntactic derivations be strictly parallel. The preceding four sections have been devoted to making clear the meaning of this statement and to illustrating its necessary and sufficient role in explaining properties of the interactions of GF-rules in agglutinative languages. Now, it is conceivable that Universal Grammar indeed contains a stipulation of essentially this form. Nevertheless, it is more likely (and more interesting to assume) that the content of this principle follows from the fundamental structure of the grammar. Clearly, the Mirror Principle will be a derivable theorem in a theory of grammar that takes both the morphology and the syntax of each GF-rule to be crucially related to a single process, taking place in a single component of the grammar. Then, for example, in the derivation of a particular structure, Causative will come before Passive both morphologically and syntactically because the two are related to one thing, and this one thing can occupy only a single place in the derivation. Under other kinds of assumptions, the Mirror Principle remains a mysterious stipulation. Section 6.1 will relate this idea to previous viewpoints and will test the basic assumptions of current syntactic frameworks against the evidence presented here. Section 6.2 will address the more general question of how the resulting theory of grammar can begin to solve certain conceptual questions in the program of explanatory linguistics.

6.1. *The Mirror Principle and the Structure of the Grammar*

The intuitive idea that syntax and morphology must “go together” in these areas has a curious status in the linguistics literature. It is assumed almost subconsciously by many researchers who work primarily on the grammar of a particular morphologically complex

²⁶ Speas (1984) represents work in progress that attempts to reduce template morphology to the other kinds, which, if ultimately successful, will be a key part of this program.

²⁷ One counterexample to the claims of this article has been pointed out by A. Marantz (personal communication). He observes that Russian and Icelandic have a reflexive morpheme that has developed a passive use, and that this morpheme occurs outside of subject agreement, even though the agreement is with the (presumably) derived subject. One might argue that this is a marked case, and indeed these morphemes were clearly enclitics historically. But perhaps a more insightful account would observe that it is not a coincidence that this happens with reflexopassives but not with “pure” passives. See Manzini (1983) for evidence that there is more to reflexopassives than meets the eye.

language. Thus, it is often a hidden assumption that underlies discussions of the use of a particular morpheme, or of what processes can cooccur in what ways in a given language. Occasionally this assumption becomes explicit, but even then it is offered without justification or consideration of its implications, but simply as a diagnostic tool to help give evidence about what the author is primarily interested in. A clear example of this is the following statement from Gibson (1980, 122) concerning Chamorro:

For a syntactic process signalled by a prefix, the relative order of this prefix and the causative morpheme *na'* - serves as a morphological indicator of whether the rule occurs in the embedded clause [i.e. underlyingly] or in the matrix clause [i.e. on the surface].

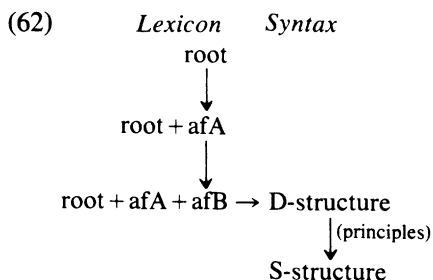
The familiarity of this idea at one level notwithstanding, I know of only two works whose specific goal is to explicate the correlation between morpheme orders and syntactic interpretations: Muysken's articles (1979; 1981) on Quechua. Muysken introduces the Quechua data concerning the interaction between causatives, reflexives, and reciprocals (cf. section 4.1) and seeks to account for them in terms of an "Extended Standard Theory" framework. He does this by enriching the set of interpretive rules that map S-structure onto LF, so that they can refer not only to syntactic structure above the word level, but also to morphological structure below the word level. Thus, his theory includes a rule of Causative Interpretation that corresponds to our rule of Causative Formation, a rule of Reflexive Interpretation that corresponds to our rule of Reflexive Formation, and so on. Then by having these rules apply in different orders in different derivations, depending on the morpheme structure of the verb, Muysken's account can achieve the same results arrived at in section 4.1. It is, however, a weakness of this account that it must still stipulate *how* the order of application of interpretive rules corresponds to the order of morphemes in a word. Muysken states that interpretive rules are triggered by the innermost morphemes first, but there is nothing in his system that would require this. Since his account cannot relate these interpretive rules directly to the actual affixations involved, it is left essentially stipulating the Mirror Principle at the level of LF. There seems, however, to be an important generalization to be captured in this area: that the order in which morphological structures must be interpreted for syntactic purposes is exactly the same as the order that is relevant for morphophonological purposes, such as morphological subcategorization and the apparent cyclic application of certain phonological rules (section 2.1). Both start with the innermost morpheme and work outward. This could be accounted for by making two assumptions: first, assuming as above that GF-changing (and linking in the case of reflexives and reciprocals) and morpheme-adding are aspects of a single process; and second, following an idea of Lexical Phonology, that phonological cyclicity can be derived by having phonological rules apply each time a morpheme is added. The fact that the two cyclicities match, both working from the inside outward, then follows necessarily.²⁸

Beyond this, other systems developed for the syntactic component of Universal

²⁸ Pesetsky (1985) makes some suggestions about how to derive cyclicity at LF on the word level that, if correct, might reduce Muysken's account and this one to the same thing by basically making this line of reasoning statable at LF. Also, the relevance of the kinds of "bracketing paradoxes" Pesetsky discusses for

Grammar cannot derive the Mirror Principle naturally.²⁹ One example of such a view is a “Very Strong Lexicalist” version of Government-Binding Theory. Consider the analysis of the passive given in Chomsky (1981) and related work, which has the following form. First, in the lexicon, a passive morpheme is attached to a transitive verb root. This morpheme has the function of changing some of the very general lexical properties of the verb, in effect, making it no longer have an agent subject and making it intransitive. Next, this morphologically derived word, with its new lexical properties, is used to construct an underlying syntactic structure (D-structure). Finally, very general syntactic rules apply in order to satisfy general principles, such as making sure an intransitive verb has no object at “surface” (S-) structure. This accounts for the way that the object becomes the subject in the English passive. Similarly, problems with respect to morphological causatives and the Projection Principle in this theory (which forbids “clause union” analyses as in Aissen (1974)) might be skirted by claiming that causative morphemes attach to verb roots in the lexicon. There they change the general semantic role assigning features of the verb, adding the “causer” role. Again, this morphologically derived word’s new lexical properties guide the construction of underlying syntactic structure, and grammatical function properties come from general syntactic principles. Now, we can imagine a theory that would extend this kind of analysis to all GF-rule and agreement processes. This theory would assume (a) that morphology simply changes syntactically relevant features of lexical items, (b) that the resulting features determine the nature of underlying syntactic structure, and (c) that syntactic rules operate in ways that depend on these features, but are otherwise insensitive to morphological structure.

This model has a number of attractive properties, but it does not derive the Mirror Principle, inasmuch as it posits a strong, principled dissociation between morphology and syntax, whereas the Mirror Principle illustrates a strong association between the two. Thus, in complex cases where a number of different GF-rules are applied, all of the morphology will take place first, changing the features of the verb root. Only then will an underlying syntactic structure be created and syntactic rules be applied. Thus, the syntax will consider only the final collection of grammatical features of the verb form. This can be schematized as follows:

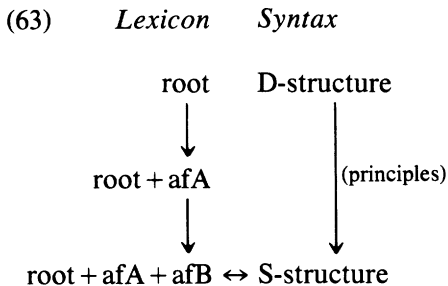


the kinds of processes considered here should provide good evidence about the right way to derive this correspondence between morphosyntax and phonology.

²⁹ In the discussion that follows I will not attempt to do justice to the full resources of the frameworks mentioned. I wish simply to illustrate the range of possible views about the relationship between morphology and syntax in a concrete way.

It is clear that the strict parallelism between morphology and syntax illustrated in the preceding sections will not in general follow from this kind of picture. For example, suppose that the feature-changing operations associated with afA and afB in (62) were commutative, in that the same final collection of features results independently of the order in which the affixes are added. This is plausibly the case for Passive and Applicative, since they are “inverse operations” in the sense that Passive is fundamentally a detransitivizing process and Applicative is a transitivity process. In this case, by “Very Strict Lexicalist” assumptions (b) and (c), the syntax will treat the two morphological structures identically, since they have identical syntactic features. Yet we have seen that different morphological structures in general correspond to crucially different syntactic structures, even when the morphemes involved are the same. Hence, this view is inadequate.

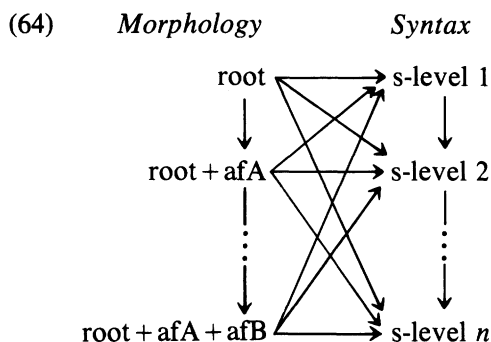
Anderson (1982) notices certain difficulties in this kind of approach, observing that it cannot account for certain dependencies between morphological form and resulting syntactic structure. In response, he offers a theory with a somewhat different structure. In essence, this theory allows syntax to operate freely, but on structures involving only bundles of features without lexical (phonological) content. In the meantime, morphology also operates freely, generating morphophonological forms that are associated with the same bundles of features. Then these lexical items can be inserted into the surface syntactic structures if and only if the grammatical feature bundles match, and the resulting structure undergoes further phonological interpretation. This type of view can be schematized as follows:



In this case, one might say that the result of the syntax determines aspects of the morphological form of the lexical item in question, whereas in the previous case (aspects of) the result of the morphology determine how syntactic processes will occur. Nevertheless, it is clear that this shift does not solve the issues raised by the parallelism between syntax and morphology that we have observed. Once again, all that matters for this view is that at the relevant point the morphological and syntactic sides match in features, without concern for how or in what order these features come to be. Thus, this view also does not naturally derive the Mirror Principle.

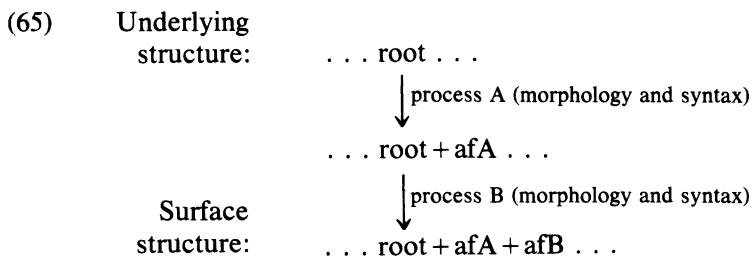
A third, somewhat different approach to fitting together morphology and syntax is suggested by work in Relational Grammar (e.g. Davies (1981), Harris (1981)). In this framework, it is emphasized that processes of grammar can be sensitive to grammatical

functions (or relations) not only at a surface level or at an underlying, quasi-semantic level, but at any number of intermediate levels as well. In fact, it has been suggested that the distribution of a particular morpheme can be characterized by predicates that include variables that range over all levels of description. Thus, first a ‘‘relational network’’ for a sentence is constructed, which is basically a global representation of a complete syntactic derivation, including explicit instances of GF-rules such as Passive. Then a morphological form for the verb in question is constructed, based potentially on properties of this relational net as a whole. This type of view can be represented schematically as follows:



Thus, instead of relating the morphology to properties of D-structure, as in the first case, or to properties of S-structure, as in the second case, this view relates morphology to properties of every stage of syntactic description. If the Mirror Principle facts presented here are correct, this view is too general. Unlike the previous two views, it does allow morphological forms to be directly dependent on the order in which GF-rules apply, but it allows them to be dependent on anything else as well. Thus, it would be just as natural in this system for the order of morphemes to be the reverse of the order of their associated syntactic processes. This, however, loses any strong explanation of (for instance) why the Quechua reflexive-causative sentences receive exactly the interpretations that they do, rather than other ones. In short, there is nothing in this system that can derive a strict parallelism between morphology and syntax either.

In order to derive the Mirror Principle, what is needed instead is a syntactic framework in which adding morphology and changing (or referring to) grammatical functions necessarily go together. To contrast it with (62)–(64), such a framework can be represented as follows:



Comparing this diagram with (5a), the diagram illustrating the meaning of the Mirror Principle, we find that (65) is simply equivalent to (5a) with the horizontal arrows shrunk to nothing. This represents the hypothesis that the correspondence between morphology and syntax required by the Mirror Principle is essentially identity (within the current domain of inquiry). Given this viewpoint, the observed parallelism between morphological derivations and syntactic derivations is a trivial consequence of the fact that there is only one derivation with both kinds of effects.

This idea is still compatible with at least two conceptually different theoretical perspectives. The theoretical diagrams prior to (65) identified two components of grammar: the lexicon and the syntax. To unify morphology and GF-rule syntax and thus account for the Mirror Principle, we must now claim that only one component is involved. But is this single component to be identified with the former notion of the lexicon, or with the former notion of the syntax proper? Or do the two notions simply collapse into one? Thus, one could claim that, in effect, GF-rule syntax must join morphology in the lexicon, producing a framework such as the Lexical Functional Grammar of Bresnan (1982b). On the other hand, one could claim that, contrary to some versions of Lexical Phonology, the morphology joins the GF-rule syntax in the syntax proper. This would lead to a framework similar to "old-style" Transformational Grammar, where transformations are allowed to tamper with word structure, in particular by adding morphemes.³⁰ Finally, if no evidence can be brought to bear on this question, it would suggest that the two theoretical perspectives are basically equivalent.

Distinguishing between these views is a subtle and complex matter, but I will suggest a form of argument that, in the present context, points toward the syntactic position over the lexicalist position. Clearly, this sort of argument will depend on precise conceptions of the lexicon and the syntax.

Minimally, the *lexicon* is a list of individual lexical items (words), together with indications of their particular properties, presumably including specifications of syntactic category, subcategorization, and selectional restriction properties.³¹ For example, in the lexicon it is expressed that the English word *put* is a verb that always requires a theme NP and a locative PP. Though the lexicon may well have more structure in terms of relationships between different lexical entries, this is essentially what the lexicon must represent.

Minimally, the *syntax proper* is the part of the grammar in which individual words are combined into phrases and the syntactic-semantic dependencies between the parts of a particular sentence are represented.³² For example, in the syntax it is represented

³⁰ Actually, "new style" Transformational Grammar or Government-Binding Theory has not moved far from "old-style" Transformational Grammar in these respects. Thus, Chomsky (1981) includes an analysis of null subject phenomena that crucially relies on "Rule R in the Syntax," where Rule R, which affixes the inflection to the verb, is a rule of the relevant type. The main difference is perhaps that Government-Binding Theory has not focused on these matters in recent years.

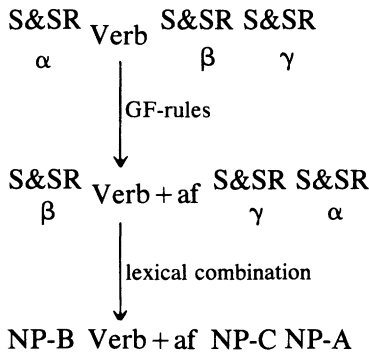
³¹ Or the information from which this information is fully derivable, such as the word's "meaning" (Pesetsky (1982)).

³² I use the expression *syntax proper* in the sense to be characterized throughout, crucially distinguishing it from *GF-rule syntax*, which is whatever processes account for the thematic relationships between actives

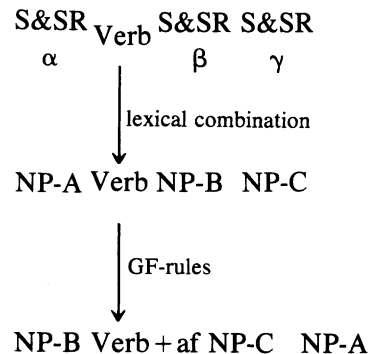
that, in the sentence *Wayne put the casserole in the oven, the casserole* is the particular direct object and semantic theme of the verb *put*, and *in the oven* is its locative PP. Though the syntax may well have more structure in terms of operations that transform these representations, this is essentially what the syntax must represent. Thus, the fundamental difference between the lexicon and the syntax is that in the lexicon words are by themselves, whereas in the syntax they are combined.

What then is the difference between the lexicalist position and the syntactic position? The lexicalist position is that GF-rules both morphologically and syntactically take place in the lexicon and operate purely on the subcategorization frames and selectional specifications of the predicates involved (Bresnan (1982b)). The specific content of the arguments of the predicates will not be filled in until later, at the point of lexical insertion (combination). On the other hand, the syntactic position is that these GF-rules operate in the syntax after lexical combination, and hence may interact with the specific content of the arguments involved. In other words, there is an ordering difference between the two viewpoints with respect to GF-rules and lexical insertion. This is represented in (66), which traces the path of a lexical item through both kinds of derivation:

(66) a. *Lexicalist*



b. *Syntactic*



(S&SR = subcategorization and selectional requirements)

With this in mind, we can see what an empirical difference between the lexicalist viewpoint and the syntactic viewpoint would look like. The lexicalist viewpoint might allow GF-rules to specify further selectional restrictions for a predicate (e.g. an agreement rule might specify the number of one of the arguments of the predicate), but it predicts that the GF-rules should operate completely independently of the ultimate content of the predicate's arguments. Thus, the class of lexical items that can be inserted in a given argument frame should be dependent only on the *final* argument structure of the predicate, and not on its initial structure. As a corollary to this, the class of items that can

and passives, between underived verbs and their causatives, and so on. Whether or not GF-rule syntax is a subpart of syntax proper is precisely the empirical question at stake here.

be inserted in a given position of a lexically derived predicate should be identical to the class of items that can be inserted in the corresponding position of an underived predicate (cf. the lexicalist derivation of Emonds's "structure-preservation" constraint on GF-rules in Bresnan (1982b, 45, 139–141)). The syntactic viewpoint, on the other hand, predicts that, since lexical insertion can happen before GF-rules, differences in insertion between simple verbs and verbs that have undergone a GF-rule change should be possible.

Crucial evidence bearing on this point is not easy to come by. However, Marantz (1984) mentions one piece of data that seems to have the right properties for establishing the syntactic viewpoint over the lexicalist viewpoint. The relevant example comes from the interaction between causatives and reflexives in the Bantu language Chi-Mwi:ni (Abasheikh (1979), cited in Marantz (1984)). This language contains morphological causatives that follow the same rule (50) as the related language Bemba illustrated in (49). Unlike the cases studied above, however, Chi-Mwi:ni does not have reflexive verb forms; rather, it has independent NP reflexives similar to those in English. In a sentence with a morphologically simple verb, such a reflexive must always appear in the direct object position and may only take the subject of the clause as its antecedent. In causative sentences, however, there is another possibility:

- (67) a. Mi m-phik-ish-iz-e ru:hu-y-a cha:kujā.
 I 1sS-cook-caus-aspect myself food
 'I made myself cook food.'
- b. Mi ni-m-big-ish-iz-e mwa:na ru:hu-y-e.
 I 1sS-3sO-hit-caus-asp child himself
 'I made the child hit himself.'
- c. *Mi ni-m-big-ish-iz-e Ali ru:hu-y-a.
 I 1sS-3sO-hit-caus-asp Ali myself
 '*I made Ali hit myself.'

(67a) is the expected sentence in which the surface direct object reflexive has the surface subject as its antecedent, and (67c) is predictably bad. (67b) is the crucial case: here, unlike what happens with morphologically simple verbs, the reflexive occurs as a secondary object taking a surface direct object as its antecedent. The obvious explanation for this apparent idiosyncrasy is that before causativization takes place in (67b), the reflexive is indeed the direct object of the (root) verb, and its antecedent is indeed the subject, as required. Thus, this is an instance of exactly the situation that is allowed by the syntactic viewpoint, but not by the lexicalist viewpoint. The antecedent-anaphor relationship between *mwa:na* and *ru:huye* is a syntactic one, depending on how independent items are combined. Yet it is dependent on the causativization process, in that the referential dependency can only be properly established before it occurs. Thus, the lexical insertion of *ru:huye* must occur prior to the GF-changing effects of causativization, and, by the Mirror Principle, prior to the affixation of the causative morpheme

as well. Thus, a “transformational” framework that combines diagrams (65) and (66b) is supported over the lexicalist alternative.³³

In fact, it is significant that the binding facts in Chi-Mwi:ni causatives in (67) are essentially the same as those in the corresponding English constructions; the English glosses have the same grammatical status as their Bantu counterparts. This is true in spite of the fact that the causative of Chi-Mwi:ni is morphological, whereas that of English is periphrastic, involving two independent verbs. Marantz (1984) observes more generally that causatives in languages obeying rule (50), such as Chamorro and Chi-Mwi:ni, have many of the same properties as English causatives; whereas causatives in languages obeying rule (42), such as Quechua and Turkish, share a variety of properties with *faire*-type causatives in French and Italian, where the latter again involve two distinct words (at least on the surface). To the extent that it is true that affixal structures show the same properties as periphrastic structures, which must be syntactic, this fact is potentially explainable if the affixal structures are also formed in the syntax and are therefore subject to the same principles. This then would constitute a more sophisticated type of argument for the syntactic viewpoint over the lexicalist viewpoint. (See Baker (1983) for a similar argument based on Noun Incorporation structures in the Iroquoian languages.)

In conclusion, I have argued that the Mirror Principle should not be stipulated as a basic principle of grammar, but rather should be derived from fundamental aspects of the organization of the grammar. In order to do this, the morphological and syntactic processes considered here must take place in the same component of the grammar. Furthermore, in order to account for interactions and parallelisms between morphologically expressed constructions and constructions relating independent words, it seems that this component must be the syntax, rather than the lexicon. Thus, by looking at the complex interactions between GF-rules, we have discovered strong and substantive constraints on the form of syntactic theory.³⁴ This also counts as a new argument that there

³³ Farmer (1984) accounts for related cases of “preserved subjecthood” in Japanese in a lexicalist-oriented framework by assigning a diacritic to any argument slot of a verb that is a subject at some point in a derivation. Then anything that has this diacritic is a valid antecedent. I assume that this is an ad hoc device to be eliminated in the above terms if possible.

³⁴ One principled, explanatory framework that explicitly begins to satisfy these Mirror Principle constraints is that of Marantz (1984). Marantz analyzes morphological causatives as being two independent verbs at underlying structure, with the causative affix filling the same position as *make* in the causative in English. Then these two verbs “merge” in the course of the syntactic derivation, and the GF-changes follow from reconstructing the syntactic structure based on the properties of the combined word. Similarly, he analyzes applicative constructions as having independent verb and preposition at underlying structure, with the applied affix filling the same position as the preposition *with* or *for* in the corresponding English sentences. These two items also merge, and again the GF-changes follow from the resulting reconstruction. Obviously, this account can explain both the parallelisms between affixal and nonaffixal constructions, and why affixation and GF-changing happen at the same time, as the Mirror Principle requires. Unfortunately, Marantz does not analyze all GF-changing rules in the same way: passive, antipassive, and (partly) morphological reflexives do appear affixed already at underlying structure and grammatical functions are changed later, in the mapping to surface structure, as in Chomsky’s (1981) account of passive discussed earlier. Thus, the derivation of the Mirror Principle in Marantz’s theory breaks down when interactions between these processes and the merger processes are considered, and a new account of them would be necessary.

must be an underlying level of syntactic description as well as a surface level: otherwise morpheme orderings must be stipulated.

6.2. *The Mirror Principle and Learnability*

The view arrived at in the last subsection begins to fill a certain gap in the program of explanatory linguistics. In particular, it links morphology and syntax in a way that allows a smaller space of possible relationships between word structure and sentence structure than other views, permitting only those relationships where the morphology transparently reveals important aspects of the syntax of a sentence. This has conceptual advantages, as I will show.

One of the deepest goals of work in generative grammar is to account for the fact that a child can learn perfectly any of the human languages, despite their enormous surface diversity. The form of grammar described here can, I believe, play a strategic role in solving this problem.

Consider Chomsky's "poverty of stimulus" argument for Universal Grammar. How can the child acquire a rich body of knowledge given a poor body of data? Chomsky's answer: the child must know most of it already, apart from the data. Therefore, there must exist a system of principles of "Universal Grammar" that guides the child in dealing with the data.

Now, it appears that in many languages, the primary challenge for this innate "Language Acquisition Device" must be in the morphology, rather than in the syntax, where this argument is most often given. Thus, in the so-called "polysynthetic" languages, a very rich knowledge of word formation is necessary, but the syntax seems relatively simple. The syntax will be recursive (probably) and hence unbounded in a simple sense, but many of these languages have no control structures, no Raising, no "Tough Movement," no parasitic gaps (probably), no Question Movement, or any of those things that make syntax "unlearnable" in a strong sense in a language like English. On the other hand, the knowledge needed to form words can be quite complex. For example, suppose a language has 50 productive affixes (Eskimo reportedly has about 400 (Woodbury (1981))) and up to seven can appear on a root without difficulty (Navajo supposedly has as many as ten). Then, if nothing else is known, there would be on the order of 7^{50} combinations of morphemes that a priori could be part of the language—yet all but a vanishingly small number are not. Thus, it is inconceivable that Eskimo children get all the crucial data that they need to find the right subset of these possibilities, and the structure of the data that they do get will be made more opaque by phonological rules, instances of zero morphology, and so on. Furthermore, the word formation process is creative and potentially unbounded in at least some of these languages, such as Mohawk (Postal (1962), Mithun (1984)) and Tuscarora (Williams (1976)), fulfilling some of the complementation tasks done in the syntax in languages like English. Therefore, by the poverty of stimulus argument, there must be principles of Universal Grammar that constrain morpheme structure. In particular, the class of possible morpheme orders must

be restricted. Similarly, if a system has two complex subsystems that interact—as morphology and syntax have been seen to do—then the set of a priori possible interactions between them will be doubly complex. Therefore, again given the “poverty of stimulus,” there must be principles of Universal Grammar that constrain the interactions of morphology and syntax. Therefore, the Mirror Principle, or some other principle much like it, must be part of linguistic theory.

The Mirror Principle ties syntax and morphology together in such a way that any constraint discovered in one system will automatically constitute a constraint on the other system. For example, in section 4.2 we explained a seemingly unmotivated morpheme ordering constraint on the relative positions of passive and applicative affixes in terms of a syntactic-semantic constraint on the semantic role structure of applicative verb forms. Similarly, in section 3 we explained the varied syntactic behavior of agreement morphemes in terms of easily observable differences in their position in morphological structure. Thus, although neither morphology nor syntax can bear the weight of explanation alone, the two of them together can. Indeed, in the general case both contribute information necessary to the task of recovering the semantic relationships between expressions in a given sentence.

The Mirror Principle also pieces together complex structures in terms of the properties of simpler structures. Thus, it helps in the task of accounting for the superficial diversity of languages in a way that is compatible with learnability, by explaining complex, presumably unlearnable differences in terms of simple, learnable differences plus an innate way of putting the pieces together. In this way, we were able to explain a difference between Quechua and Bemba in how complex reciprocal-causative sentences are interpreted.

For these reasons, the Mirror Principle—or more accurately the structure of the grammar that derives it—seems to be an important piece in the puzzle of explanatory generative grammar, supported by both theoretical necessity and empirical fact.

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