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Author(s): Jerrold M. Sadock

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## Parts of Speech in Autolexical Syntax

Jerrold M. Sadock  
University of Chicago

Aristotle (*De Int* 2:20, e.g. Ackrill, 1987) told us that nouns are words that do not express time. Bloch and Trager (1942) said that nouns are words that are centers (i.e. heads) of substantive phrases that may be preceded by modifiers. Langacker (1987) told us that nouns indicate regions in a domain, and Miss Reardon told me that nouns are names of persons places, or things.

None of these claims is wrong, *per se*, but the problem that I see with each of them is that it is one sided. Aristotle's rule for recognizing nouns is (basically) morphological, since what he meant was that Greek nouns do not take tense inflections. Bloch and Trager provided a completely syntactic criterion (though elsewhere, to be sure, they included morphological touchstones.) Langacker's characterization is semantic, employing entirely cognitive constructs, and my fifth grade teacher's definition was pragmatic, noting the use to which nouns are typically put. It seems clear to me that nouniness involves all of these things, and that similarly, for other parts of speech, characteristics relating to various linguistic dimensions figure in their classification. The multi-modular view of parts of speech is familiar (see, for example, Schachter 1985), and I will therefore not attempt to back it up, except by example. What I wish to do here is to show that the multi-modular definitions of parts of speech can be given natural and enlightening formulations in a theory, such as Autolexical Syntax, that radically separates the representation of linguistic expressions in the various components of the grammar.

Suppose we take a grammar to be a set modules or components, each of which is itself a grammar of an independent level of linguistic representation (i.e. the "tactics" of that level in the terminology of Stratificational Grammar (Lamb 1966, Lockwood 1972)). The number and nature of the modules needed for the accurate description of natural languages is a complex, partly empirical, and partly theoretical issue, but to begin with, let us assume the existence of three traditional modules: syntax, semantics, and morphology. The syntax specifies the phrasal constituent structures that the language allows, the semantics gives us the set of well-formed meaning structures in the language, and the morphology the set of well-formed morphological entities, less formally: words. I take it to be a virtue of this system of grammar that there is only one autonomous set of semantic principles, and one autonomous set of morphological principles, a virtue absent in many hierarchical theories where both semantics and morphology are split into two or more quite separate components.

Finally let us suppose that, unlike what is assumed in Stratificational Grammar or Transformational Grammar, these modules are not hierarchically related to one another. Conceived of as a grammar of a certain dimension of representation, a module need not wait for the output of another to do its work, but has the power to generate (or analyze) an infinite set of representations quite independently of what is going on in any of the other components. Each component is a self-contained system, with its own independent set of rules, principles, and basic vocabulary.

The glue that binds these independent grammars together and makes them a description of a single language is the lexicon, an annotated list of the fixed expressions in the language, be they morphemes, words, or phrases. Each item on this list, i.e. each lexeme, also includes statements as to its behavior in each of the parallel modules, indicating, for example, whether the item is a morphological stem or affix, whether it combines syntactically with NP complements, and whether it is a predicate or operator in the semantics, and so on. Besides the lexicon as a link between essentially autonomous

representations, a system of general matching constraints comprising an interface module is needed. This interface component sees to it that the topological properties of different dimensions of representations are sufficiently similar to be representations of the same expression, preventing, for example, the association of the syntactic structure of John thinks that Larry left with the semantic structure of Larry thinks that John left.

I will call the basic idea that the topological properties of the autonomous representations of a single expression must be similar the General Homomorphism Constraint. There are two parts to this, one concerning hierarchical structure and the other concerning linear order, which may be informally stated as follows:

(1) General Homomorphism Constraint

a) Constructional Integrity Constraint

Elements associated to two different autonomous representations must bear the same hierarchical relations in both.

b) Linearity Constraint

Elements associated to two different autonomous representations must occur in the same linear order in both.

There are various ways in which these constraints are sometimes relaxed, allowing for the existence of partly non-congruent pairs of representations. I take up the question of constraining mismatches in considerable detail in my forthcoming book (Sadock forthcoming), but for the most part it need not concern us here.

Given some rudimentary modules, such as the ones contained in the appendix to this paper, we will immediately notice that the lexicon will contain not only large classes of lexemes with particular properties in individual modules, but also with similar alignments of properties across the various components. It is the case that the distribution of nouns, for example, is largely consistent within the syntax. To a great extent it is exactly the same items that can take prepositional complements (as per SF9) as refuse NP complements or V-Bar complements, and this is almost exactly the same set that can take preceding determiners according to SF2. To capture such intermodular generalizations, we use the same symbol "N" in various rules such as SF2 and SF9, but a different symbol, "V" in SF4 or SF6.

When we examine the morphology we also find that the lexicon is partitioned according to the distributional privileges of its members. Not all stems can be inflected and derived in all possible ways in a language like English (as opposed to Nootka (Sapir 1921, Swadesh 1939)), so morphological stems will have to be divided into various classes according to the range of morphological processes they can undergo. Reader, and teflon-like are possible words of English, but read-like and tefloner<sup>1</sup> are not. We can extract a long list of items that admit the agentive suffix -er, and reject the adjectival suffix -like, and a long list that have exactly the opposite behavior. True, many phonological stems allow both kinds of suffixes, but these are always ambiguous: There are two very different stems bear in bearer and bear-like, to take an extreme example. We might provisionally call the class that can be suffixed with -er but not with -like A-stems, and the other class B-stems, for we have no grounds as yet for calling them verb stems and noun stems.

But just as soon as we turn our attention back to the syntax, we are struck by the fact that by and large, the morphological A-stems are the Vs in the syntax, and the

morphological B-stems are the Ns. As reasonable and mundane as this association might seem to be, it is not a logical necessity. One could certainly conceive of a language in which the classes obtained on the basis of morphological behavior do not correspond in any way to the classes obtained by noting how things behave in the syntax. There is, after all, Nootka, which Sapir 1921 and Swadesh 1939 described as having only one morphological class up to the inflected word, but at least two classes in the syntax<sup>2</sup>. We could also imagine a language in which all morphological classes are phonologically based, but no syntactic classes are.

But most languages do not work that way, and we are quite secure in the expectation that the major classes of stems in the morphology will turn out to correspond to a large extent to the major classes in the syntax, and thus deserve to be called by the same names that we use for syntactic classes, namely verbs and nouns. We might even elevate this expectation to a principle (and I believe we should), thereby making an important empirical claim:

(2) In the default case, a morphological X will be a syntactic X.

Nevertheless, we must bear in mind that words like "noun" and "verb" are importantly ambiguous, and for that reason, I will regularly distinguish the nouns extracted on the basis of syntactic criteria from those that we get by taking note of morphological facts by using positive bar level symbols for the former, and negative ones for the latter, even for uncomplemented (zero bar) categories.

Thus the lexicon will contain derivational affixes such as (3) and (4) that respectively apply to noun stems (our erstwhile B-stems), or yield noun stems. Therefore teflon-liker is ungrammatical (in the intended sense where teflon-like is a derived adjective), but reader-like, is possible, though not current. The lexicon will also contain inflectional affixes that are restricted more-or-less to the same noun stems and verb stems as defined by their distribution under derivation.

(3) -like

morphology: [<sub>A</sub>[-0] N[-0] \_ ]

syntax: null

semantics: like'(N') = M(CN) "like an N"

(4) -er

morphology: [<sub>N</sub>[-0] V[-0] \_ ]

syntax: null

semantics: er'(V') = CN "x:[V'...(x)]"

The syntactic field in each of these lexical entries indicates that the lexeme itself is not a formative in the syntax. There is no syntactic noun -er in the sentence The farmer killed the duckling. But that is not to say that an adjective stem formed with -like, or a noun stem formed with -er, will have no syntax. Indeed, by (1), we should expect them to behave like ordinary syntactic adjectives and nouns, as is correct.

Now let us consider the semantics. As far as the formation rules of the semantics (i.e. the syntax of the semantics) is concerned, the majority of logicians would class nouns and verbs together as predicates. To be sure, there is a tendency for nouns to be one-place predicates, and verbs to have valence greater than one, but the statistics are hardly overwhelming. Gupta 1980, however, has suggested that common nouns and verbs belong to distinct combinatoric semantic classes. For Gupta both common nouns and intransitive verbs are subject to a "principle of applicability" that can be formalized as a predicate, but only nouns are also subject to a "principle of identity" such that they can be

directly involved in the formation of restricted quantifiers, as shown in LF8 in the appendix.

As before, the use of the word "noun" for those entities that function in the semantics as restrictors of abstract quantifiers is something of a pun. I will therefore call them CNs (for "common noun," following the logical tradition) to distinguish them from syntactic nouns or morphological noun stems. The other semantic categories are also given semantic symbols that differ from the corresponding syntactic or morphological categories, but here the difference is probably too great, since the spirit of the rule in (1) clearly ought to be extended to the semantics as well.

The semantic rules in the appendix to this paper state only combinatoric features of semantic representation, neglecting content entirely. But some aspects of semantic content, in particular something like the notion of thematic role, familiar to modern linguistics since Gruber 1965 and Fillmore 1968, might well require representation in an adequate autonomous-modular grammar for natural languages, as Steven Lapointe 1987, Jan Terje Faarlund (1989), and Eric Schiller (1989) have variously suggested. While each of their methods for incorporating thematic information has something to be said for it, for purposes of discussion, I will use the system argued for by Faarlund, for one thing, because it is the simplest.

Faarlund proposes that thematic roles ought to be displayed on an autonomous level, distinct from both phrase-structure syntax and combinatoric semantics, and further assumes that there are just three universal roles, AGENT, THEME, and LOCUS. As in other work on relational roles, he assumes a version of the Stratal Uniqueness Law (Perlmutter and Postal 1983), or Functional Completeness and Coherence Principles (see chapters 2 and 4 of Bresnan, ed. 1982), that rules out single assigner-role structures in which more than one item is assigned to the same role. Therefore, wherever we encounter structures with two identical roles, we must assume that there are two role-assigners in this dimension of representation (though not necessarily at any of the others.) As has been pointed out by various authors over the last twenty years, various sorts of predicative elements will differ as to the number and type of thematic roles that they assign. The verb run assigns an agent, kill an agent and a theme, slip a theme, and so forth.

What is striking as far as part-of-speech distinctions are concerned is this: While it is typical for verbs to assign specific relations with palpable semantic content to their arguments, it is not typical for nouns. With one principled type of exception, ordinary nouns such as sparrow, sugar, table, liberty, and Stalin<sup>3</sup>, be they natural kind terms or artifacts, common or proper nouns, mass or count, concrete or abstract - all regularly fail to assign role relations of any sort. If x is a sparrow, it is not so in an agentive fashion, or a locative fashion, and is only a theme if "theme" is a catch-all category with no particular actual semantic content. The themes of the vast majority of verbs deserve the more significant name "patient" in that an aspect of their existence or location is established or altered in the event-type indicated by the verb. Even relational nouns like brother, name, or hand, which are two-place predicates semantically, normally do not assign ordinary thematic relations. If x and y are brothers, neither is an agent, and neither a theme: they are simply brothers. Of course Stalin killed the sparrow has Stalin as agent and the sparrow as theme, but that is because of the roles that the verb assigns. In the predication sparrow'(x), there is no indication whatsoever of the bird's destiny.

The exception alluded to above are those nouns that we call nominalizations. Such nouns regularly do assign standard role relations to their arguments. The obligatory arguments (i.e. the arguments that are quantified in expressions of the form each N, etc.) of runner and killer, are clearly agents, for example, and the obligatory argument of

discovery (in one sense) is clearly a theme. But these are not typical nouns, a point to which I will return.

Preliminarily, then, we can say that nouns are characterized by the following four potentially independent properties in four modules:

(5) a noun is:

morphology: N[-0]  
 syntax: N[0]  
 semantics: CN<sup>-n</sup>  
 thematics: assigns no relations

Typical verbs, on the other hand, differ with respect to all of these properties.

(6) a verb is:

morphology: V[-0]  
 syntax: V[0]  
 semantics: F<sup>-n</sup>  
 thematics: assigns relations

It is this maximal contrast between the class of nouns and the class of verbs that makes them the two classes that will be found in every part-of-speech system. The third most popular class of lexemes, that of adjectives, contrasts strongly with both verbs and nouns in three out of four components, though relationally, I can find no clear generalizations. Many adjectives, like big, blue, and wooden would seem to assign no relation, like nouns, but others, such as careful, fond, and honest do. Note also that adjectives are subsidiary to nouns in both the syntax and semantics: there can be nouns without adjectives, but not adjectives without nouns.

The typical schema for adjectives, then, is as in (7).

(7) an adjective is:

morphology: A[-0]  
 syntax: A[0]  
 semantics: M(CN)  
 thematics: no generalization

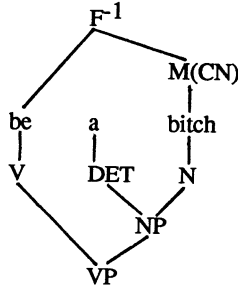
What is of interest here is the fact that the lists of properties in (5), (6) and (7) characterize the typical members of the group, but not every member. Lexemes may depart in one or more ways from these sets of inter-modular expectations, and be fully nominal, verbal, adjectival, etc. in one or more components, but not in all of them. We have already seen that nominalizations, though syntactically and morphologically nouns, are thematically more like verbs in that they borrow their role-assigning properties from the verbs they are derived from.

This approach to parts of speech systems raises any number of questions concerning the association of different sets of properties from different modules and only a tiny fraction of them can be taken up in a paper of this length. All that I can do in the space and time allotted to me is explore a few examples of aberrant sorts of English words in an effort to illustrate the power of the system sketched here.



syntax. Thus in the sentence This problem is a bitch the verb phrase has the bimodular structure given in (10), where the syntactic formative a is unconnected with anything in the semantics. For this reason one cannot say \*A problem is that bitch (which is well formed on an unpleasant, sexist reading, but not with the intended meaning).

(10)



Semantic nominal modifiers that are syntactic mass nouns don't need an empty article when used predicatively, since such nouns form NPs directly. But when used as prenominal adjectives that form N[1]s, an article is still needed for both the syntax and the semantics of the whole NP. Therefore the contrast between the a. and b. examples below:

- (11) a. This problem is hell.  
 b. \*This problem is a hell.
- (12) a. This is a hell of a problem.  
 b. \*This is hell of a problem.

Let us turn to another variety of anomalous nouns, those that pretheoretically seem to function as a quantifiers, such as bunch and lot in (13).

- (13) A bunch/lot of students demonstrated.

Suppose we simply say that bunch, and other quantificational nouns like it, have lexical entries such as (14), where the syntacto-semantic correlation between the syntax and semantics is overridden by specific lexical stipulation.

- (14) bunch:

syntax = N[0]  
 semantics = Q<sup>-1</sup> "many"

As a syntactic noun, bunch will not occur in configurations typical of quantificational adjectives or determiners (\*bunch boys, cf. many boys), but rather where nouns occur, namely as heads of NPs. Once again, as with adjectival nouns like bitch, bunch will occur with the semantically empty syntactic indefinite article, and with the semantically empty preposition of, in exactly the same syntactic configuration as the adjectival noun: a bunch of students. Indeed, it occurs in the same syntactic frame as its non-quantificational homonym: a bunch of flowers.

It is important to note why structures like these are the only configurations possible. Both \*a problem of a bitch and \*boys of a bunch, while syntactically well formed, will not match the semantic structures they must have in virtue of the stipulated properties of bitch and bunch. As a modifier of CN expressions and as a quantifier, respectively, both will have semantic scope over the noun meanings they take as arguments, and therefore, all other things being equal, will have to occur higher in the syntactic tree than the nouns they occur with by the General Homomorphism Constraint on intermodular structural matching given in (1a).

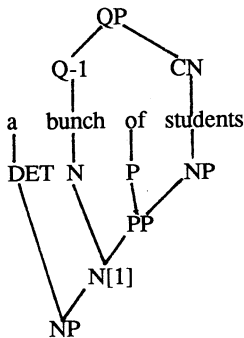
Several properties of the word bunch are directly accounted for by this simple idea of its cross-categorial status, including the following:

1) Quantifier scope ambiguities: Quantificational bunch and its ilk generate scope ambiguities that do not involve existentials. In I haven't seen a bunch of flowers, the ambiguity is one of existence: either I didn't see a specific bunch of flowers, though I might have seen some, or I saw no bunch of flowers at all. But in I haven't seen a bunch of articles on that topic, either there is a specific set of articles I haven't seen, or there are only a few I have seen. In other words, there is no sense here in which an existential quantifier is inside the scope of a negative operator. On the present theory this follows from the simple fact that there is no existential quantifier in a bunch of articles. (See structure (15) below.)

2) Peculiarities of modifiers: Any meaningful element of syntax must have both coherent syntactic and semantic roles to play, that is, it must occur in syntax in positions where the syntactic categories to which it belongs can occur, and it must behave in semantic structures in the way that its semantic categorization determines.

Now if we consider the bimodular structures like (15) in which quantificational bunch can be found, it is immediately apparent that normal adjectival modifiers of the syntactic N-bar bunch of students should be impossible.

(15)



Adjectives take CNs to CNs in the semantics, but the only semantic CN in (15) is students, and if that CN is to be modified, the modifier should show up with it, by the same constraint demanding hierarchical congruence mentioned above. Interestingly, though, misplaced modifiers are sporadically acceptable in just these structures, while misplaced modifiers are totally impossible in corresponding syntactic structures with normal semantics. .

- (16) an impressive bunch of publications  
 = "a bunch of impressive publications"  
 (17) I've never met a bigger bunch of idiots.  
 = "I've never met a bunch of bigger idiots."  
 (18) the disgusting remains of animals  
 not = "the remains of disgusting animals"

While the readings in (16) and (17) are violations of (1a), we may observe that they are, in an intuitive sense, not as bad as they would be in the case of (18). Since the meaning of the modifiers in (16) and (17) could not possibly apply to the elements they are syntactically associated with, no confusion could result. Still it is puzzling why the misplacement should be allowed at all, let alone sound better than their translations into "logical order", as is the case with (17).

There is one other sort of modification allowed, as exemplified in (19):

- (19) A big bunch of students marched on the Administration Building.

Here there is no violation of the general Homomorphism Constraint, since big in such examples is clearly a semantic modifier of the quantifier, much as very is in very many students: a big bunch of flowers can consist of four enormous flowers, a big bunch of students must contain many more students than that, regardless of their size. This big must be the same word observed by McCawley in examples like (20), a syntactic adjective that is semantically an intensifier of adjectival or quantifier meanings. In fact, big can intensify ordinary predicate meanings, as in (21) or (22). One doesn't find this use in the case of verbal examples like the ungrammatical (23) for the simple reason that big is always an adjective, and hence whatever it modifies must somehow or another be expressed as a noun.

- (20) This problem is an even bigger bitch than that one.  
 (21) She is a big Cubs fan.  
 (22) Sam is the biggest eater in the state.  
 (23) \*He roots big for the Cubs.

- (24) big

syntax = A  
 semantics = M(X) "X to a high degree"

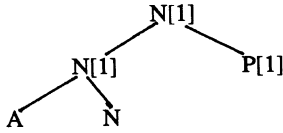
A similar unusual adjective is whole, an intensifier of quantifier meanings in whole lot and whole bunch. It cannot modify the meanings of other sorts of semantic functions, however: \*whole bitch, \*whole Cubs fan. This highly restricted word therefore has the following lexical entry:

- (25) whole

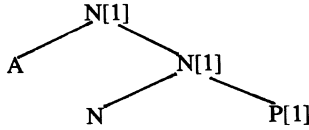
syntax = A  
 semantics = M(Q<sup>-1</sup>) "very much X"

3) Limited conjoinability. According to the simple syntactic rules SF9 and SF11, an adjective may be combined with an N-bar either inside or outside a prepositional phrase, as in (26) and (27), respectively:

(26)

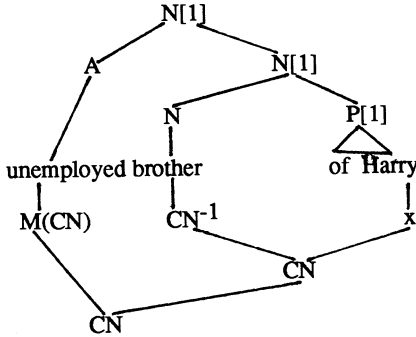


(27)

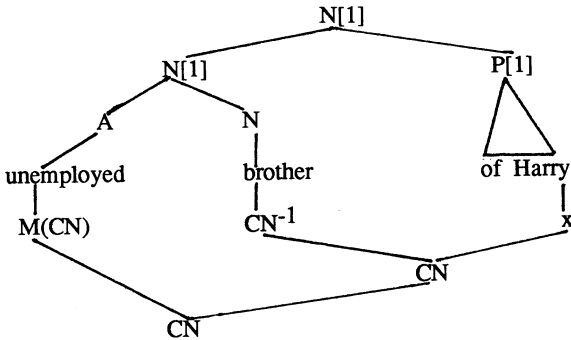


Which structure one finds is not an arbitrary matter, but, through (1a) depends on semantics. Thus subcategorized PPs will be inside restrictive adjectives, a result that follows in the present framework from the general homomorphism constraint plus the fact that subcategorized PPs, or rather their nominal objects, will be semantic arguments of lexical nouns (cf. LF11). Therefore the phrase unemployed brother of Harry will have the dual structure in (28), where the constituency of the syntactic and semantic trees match, rather than that in (29), where they do not.

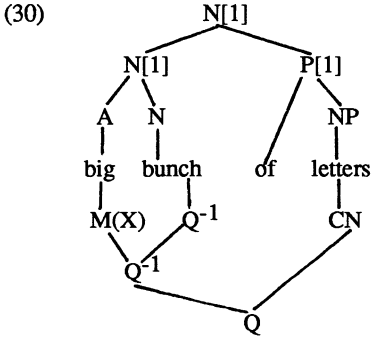
(28)



(29)



But in (30), the adjective will modify the quantificational noun in the syntax, because it takes the quantifier as an argument in the semantics.



Therefore, there will be no N-bar bunch of letters in (30), and the following will be ungrammatical:

- (31) \*I noticed a whole bunch of students and lot of professors.  
(Compare: I put in a whole bunch of celery and clove of garlic.)

4) Limited one pronominalization. This identity of sense pronominal needs an N-bar antecedent in syntax with a CN meaning to refer to. Thus when we have structure like a picture of a dog that wrote a novel, one can usually refer to any of the meanings of the included N-bars.

- (32) Bill has a picture of a dog that wrote a novel, but only Fred has
- actually written one himself.  
(one="novel")
  - actually met one personally.  
(one="dog that has written a novel")
  - actually taken one.  
(one="picture of a dog that has written a novel")

But while there are two N-bars in a bunch of students, there is only one CN meaning, as shown in (15). Therefore:

- (33) Bill knows a bunch of Republicans, but Fred is actually friends with one  
(one = "Republican"; not "bunch of Republicans")

5) Agreement. One of the most striking features of quantificational nouns is that they form noun phrases whose agreement properties are those of the object of the subordinate preposition:

- (34) A lot of people \*doesn't/don't think so.  
(35) A lot of sugar isn't/\*aren't healthy.

There is a morpho-syntactically plural alternative to a lot, namely lots. When this alternative is chosen, the agreement pattern is unaffected:

(36) Lots of people \*doesn't/don't think so.

(37) Lots of sugar isn't/\*aren't healthy.

What this shows is that the agreement in these cases is controlled by semantics, rather than morpho-syntax, a phenomenon that has been documented elsewhere (Morgan 1972). However one chooses to handle semantic agreement, it is obvious that having semantic structures that make structures with quantificational head nouns identical to structures with quantifiers will make the extension to this class of phrases a fairly simple matter.

## Appendix: Grammar Fragments

### 1. Syntax

- (SF1)  $S \rightarrow N[2] V[1]$
- (SF2)  $N[2] \rightarrow \text{DET } N[1]$
- (SF3)  $V[1] \rightarrow V[0, \text{SF3}]$
- (SF4)  $V[1] \rightarrow V[0, \text{SF4}] N[2]$
- (SF5)  $V[1] \rightarrow V[0, \text{SF5}] V[1, [\text{to}]]$
- (SF6)  $V[1] \rightarrow V[0, \text{SF6}] V[1, \text{BSE}]$
- (SF7)  $V[1] \rightarrow V[0, \text{SF7}] S[1, \text{IND}]$
- (SF8)  $S[1, \text{IND}] \rightarrow \text{COMP}[\text{SF8}] S[\text{FIN}]$
- (SF9)  $N[1] \rightarrow N[1] (\text{PP})$
- (SF10)  $P[1] \rightarrow P N[2]$
- (SF11)  $N[1] \rightarrow A N[1]$
- (SF12)  $V[1] \rightarrow V X[2]$

### 2. Semantics

- (LF1)  $F = F^{-1}(i)$
- (LF2)  $F^{-1} = F^{-2}(i)$
- (LF3)  $F^{-2} = F^{-3}(i)$
- (LF4)  $F = O^{-1}(F)$
- (LF5)  $F^{-1} = O^{-2}(F)$
- (LF6)  $F^{-2} = O^{-3}(F)$
- (LF7)  $X = MX(X)$
- (LF8)  $Q = Q^{-1}(\text{CN})$
- (LF9)  $F = Q(F)$
- (LF10)  $\text{CN} = M(\text{CN})$
- (LF11)  $\text{CN} = \text{CN}^{-1}(i)$

### 3. Morphology

- (MF1)  $X^{-1} \rightarrow X^{-0}, Y$
- (MF2)  $X^0 \rightarrow Y^0, X$
- (MF3)  $W^{-2} \rightarrow X^{-n}, Y$
- (MF4)  $X^{-0} \rightarrow X^{-0}, Y^{-0}$

### Footnotes

<sup>1</sup>Tefloner is possible, of course, as the agentive nominal of a neologistic verb teflon (perhaps "to apply teflon to"), but that reinforces the point being made here, which is simply that the agentive suffix only applies to morphological verbs.

<sup>2</sup>For some important caveats on this analysis, see Jacobsen, 1979.

<sup>3</sup>Proper nouns are not ordinarily treated as predicates, but whatever they are, they are ordinarily not role assigners.

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