

A Bi-Polar Theory of Nominal and Clause Structure and Function

Jerry T. Ball

Air Force Research Laboratory, Mesa, Arizona

Jerry.Ball@mesa.afmc.af.mil

A bi-polar theory of the structure and function of nominals and clauses is presented in which a specifier, functioning as a referential pole, and a head, functioning as a relational pole, combine to form a referring expression. The theory applies to both object referring expressions, in the case of nominals, and situation referring expressions, in the case of clauses. The bi-polar theory is contrasted with X-Bar Theory—a uni-polar theory in which the head uniquely determines the type of the larger expression in which it occurs. Uni-polar theories adopt a strong notion of endocentricity, which is rejected in the bi-polar theory, where both the specifier and the head make significant and meaningful contributions to the larger expressions in which they occur. The bi-polar theory is also contrasted with Langacker's conception of the basic structure and function of nominals and clauses.

Keywords: nominal, clause, specifier, head, structure, function, meaning

1. Introduction

Grammar encodes meaning (Wierzbicka, 1988). “Grammar is simply the structuring and symbolization of semantic content” (Langacker, 1987, p. 12). Grammatical variation is largely the result of a compromise between the differing requirements for the encoding of both semantic and discourse pragmatic aspects of meaning (Givón, 1984). “One should prefer a semantic theory that explains otherwise arbitrary generalizations about the syntax and the lexicon...a theory's deviations from efficient encoding must be vigorously justified, for what appears to be an irregular relationship between syntax and semantics may turn out merely to be a bad theory of one or the other” (Jackendoff, 1983, pp. 13-14).

The above statements support the position that there is a close relationship between form and function, between syntax and linguistic semantics. The statement by Jackendoff is called the *Grammatical Constraint*. In its strongest form—the form adopted in this paper, although not by Jackendoff—linguistic representations of form and function, syntax and linguistic semantics, are not distinct. There are no syntactic representations that are purely formal, lacking functional and semantic content. Such representations fail to capture the functional and semantic generalizations that allow us to make sense of linguistic form.

Two key dimensions of meaning that get grammatically encoded are *referential meaning* and *relational meaning*. The key claim is that, in English, these two dimensions of meaning are typically encoded in distinct grammatical poles—a *referential pole* and a *relational pole*—with a *specifier* functioning as the locus of the referential pole and a *head* functioning as the locus of the relational pole. At this level of description, the term “relational pole” is used generally to encompass objective (noun, pronoun, proper noun) as well as relational (verb, adjective, adverb, preposition) heads. For example, in the expression

(1) The dog

the determiner “the” functions as a specifier and the noun “dog” functions as the head. The grammatical function of a specifier is to identify the referential type of an expression—in this example an *object referring expression* or *nominal*. The grammatical function of a head is to identify the relational (or objective) type of an expression—in this example a type of object. The specifier and head combine to form a *referring expression*—in the example an object referring expression that refers to a dog.

Contrast example 1 with

(2) The kick

in which the specifier functions to identify an object referring expression even though the head “kick” describes a type of relation—more specifically, a type of action. The specifier dominates the head in determining the referential type of the expression. The effect is the *construal* of an action as though it were an object. In this objective construal, the participants in the relation are left unexpressed.

Construal is a basic cognitive process defined by Langacker (2000, pp. 26-27) as “our ability to conceive and portray the same situation in alternate ways”. Langacker goes on to say that “linguistic elements—both lexical and grammatical—impose particular construals on the conceptual ‘content’ they evoke”. The use of a verb as the head of a nominal is an example of grammatical construal. Whether a word describing some concept is prototypically a noun or a verb (in a given language) is a form of lexical construal.

In allowing words describing relations to head nominals, English grammar provides a fairly general mechanism for construing relations as though they were objects. This is particularly true of words describing actions which occur instantaneously and are easily objectified:

(3) The *hit*

(4) The *strike*

(5) The *crunch*

There are also more specialized constructions in which verbs can head nominals. (Nominal, as used here, is functionally synonymous with object referring expression and is distinct from *noun phrase*, which is a phrasal form that presupposes a noun head.) Dixon (1991) discusses a collection of constructions which he calls the “GIVE A VERB, HAVE A VERB, and TAKE A VERB” constructions. In the expression

(6) He gave the ball a kick

Dixon treats “kick” as a verb heading a noun phrase (nominal would be more consistent with the terminology used herein) as sanctioned by the “GIVE A VERB” construction. Dixon surveys about 700 verbs and concludes that “about one-quarter of them can occur in at least one of the constructions HAVE A VERB, GIVE A VERB, and TAKE A VERB” (Dixon, 1991, p. 337).

Numerous forms of expression may also head nominals. In an expression like

(7) His *giving money to strangers*

the verbal expression “giving money to strangers” functions as the head of a nominal (Pullum, 1991). Given examples like (2) to (7), any strong notion of *endocentricity* (Bloomfield, 1933) common to *uni-polar* theories of grammar wherein the head uniquely

determines the type of the larger expression in which it occurs (X-Bar Theory—Chomsky, 1970; Dependency Grammar—Hudson, 2000) must be relaxed.

It is important to distinguish the part of speech of a lexical item or the phrasal form of an expression from its grammatical function. Insisting that the head of a nominal is necessarily a noun and that a nominal is necessarily a noun phrase only leads to confusion resulting from the confounding of grammatical function with part of speech and phrasal form. Further, the linguistic methodology of using syntactic location to determine part of speech exacerbates the effects of this confusion. Based on syntactic location and the confounding of grammatical function with part of speech, the word “running” in

- (8) The bull is *running*
- (9) The *running* bull
- (10) The *running* of the bull

would be categorized as a verb (participle) in (8), an adjective in (9), and a noun in (10). Yet there is no obvious difference in the meaning of “running” across these expressions. An alternative approach is to treat “running” as a verb (participle) that functions as the head of a clause in (8); that functions as a (pre-head) modifier in (9); and that functions as the head of a nominal in (10). Based on these examples and others to follow, it is argued that purely syntactic representations fail to make important grammatical generalizations. It is only in recognizing the grammatical functions of lexical items and expression forms that the generalizations follow. The representations proposed in this paper integrate form and function in a manner that embraces the functional labels used by Chomsky in his description of X-Bar Theory (and the semantic intuition underlying the choice of these functional labels), but which are avoided in his purely formal notation. For example, Chomsky (1995, p. 53) notes that “the notions specifier, complement, and adjunct are functional (relational)”, but in his formal notation he uses the formal labels Z, W, and Y stating that “we call Z the *specifier* (Spec) of X^2 , the elements of W the *complements* of X^0 , and Y...an *adjunct* of X^2 ”. Jackendoff (1977, p. 17) is less circumspect in this respect, introducing the classic tree structure representation of X-Bar Theory:

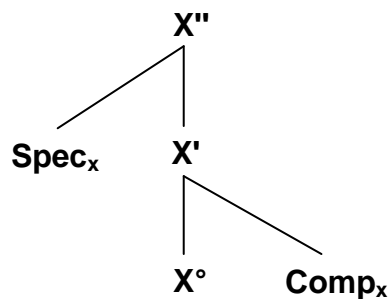


Figure 1: A variant of X-Bar Theory from Jackendoff (1977)

This tree structure representation effectively mixes the functional labels specifier and complement with the formal labels X^0 , X' and X'' , which range over formal lexical and phrasal categories. However, in Jackendoff’s formulation of X-Bar Theory, Spec_x and Comp_x are treated formally and are not accorded functional status. Cook and Newson (1996, p. 149) add the functional category *head* at the level of X^0 in their description of X-Bar Theory along with specifier and complement, noting that these are functional

labels, not syntactic categories. Sells (1985, p. 28) uses the functional categories specifier, argument and modifier along with the formal categories X, X' and X'' in his representation. For the bi-polar theory, the functional status of specifiers and complements is recognized and explicitly represented. Further, X⁰ as projected through X' and X'' is functionally the head, and as Kornai and Pullum (1990) argue, “headedness” is a central element of X-Bar Theory. Finally, the term “adjunct”, which might be viewed formally as specifying a relative location, is replaced with the explicitly functional term “modifier”.

The key advance made in X-Bar Theory is recognizing the distinction between specifiers and modifiers (called adjuncts by Chomsky). Chomsky (1970) realized that a specifier plays a different syntactic role than an adjunct. The specifier combines with a non-maximal head (X') to form a *maximal projection* (X'' or XP). However, the syntactic basis of X-Bar Theory leaves this distinction unmotivated. In contrast, for the bi-polar theory, a maximal projection corresponds to a referring expression, and it is the specifier in combination with the head that typically determines a referring expression.

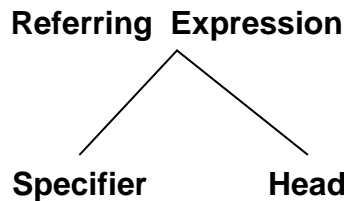


Figure 2: Specifier + Head = Referring Expression

As a simple example of where a purely formal analysis breaks down, consider the use of pronouns like “he” and proper nouns like “Genoveva Cardenas” as full nominals in addition to typical noun phrases like “the dog”. In sentential expressions like “he ate” and “Genoveva Cardenas slept”, an analysis that relies on “he” and “Genoveva Cardenas” being NPs according to the formal rule (from early generative grammar)

$S \rightarrow NP VP$

must allow NPs to have substantially different forms:

$NP \rightarrow \text{pronoun}$

$NP \rightarrow \text{determiner noun}$

$NP \rightarrow \text{proper-noun}$

Worse, to be consistent with X-Bar Theory, pronouns and proper nouns must be nouns, since it is the head noun which projects the phrasal category NP. But pronouns and proper nouns do not have the same distribution as nouns. In particular, they don’t normally occur with determiners in English. While they do have similar distribution to noun phrases, they are not headed by a noun. Pronouns, proper nouns and noun phrases can all function as nominals. The appropriate generalization is over their ability to function as nominals, not in insisting that pronouns and proper nouns have the form of noun phrases, or nouns, which they do not.

The introduction of functional heads in later variants of X-Bar Theory and the DP Hypothesis (Abney, 1987) only make the situation worse. The DP Hypothesis claims that noun phrases are actually headed by determiners with the (former) noun head occurring

as part of an NP complement. However, there is no determiner in the case of pronouns, proper nouns and indefinite uses of plural nouns like “dogs” in “dogs are cute” and mass nouns like “rice” in “rice is healthy”. If Determiner Phrases (DPs) are necessarily headed by determiners, then pronouns and proper nouns, and plural nouns and mass nouns (when they occur without a determiner) must be determiners! Support for this odd position is suggested by Cook & Newsome (1996, p. 184) “In the DP analysis, pronouns are heads of DPs (and should now perhaps be called pro-determiners!)”. Even in the case of simple noun phrases like “the dog”, treating “dog” as the head of an NP complement is highly questionable since it is unclear why “dog” should project an NP other than to satisfy the theory internal requirement that complements must be maximal projections.

Rejecting a purely formal basis for determining the part of speech of words leads to a return to a more traditional method for their definition which considers semantic information, grammatical function, morphological and distributional information and information about frequency of use. The base part of speech of a word is defined in terms of the prototypical function of the word in a given language, which leads to the encoding of the word as such in the *mental lexicon*—the repository of entrenched words, fixed expressions and learned constructions. Words that prototypically function as clausal heads in English describe relational concepts; these concepts are further subcategorized as verbs, (predicate) adjectives and (predicate) prepositions. (Attributive) adjectives prototypically function as modifiers in nominals. Prepositions function as the heads of modifying prepositional phrases and as verbal modifiers (often called verb particles in this function). Verbs have special inflectional forms like the -ing and -ed participial forms, which distinguish them from adjectives and prepositions. (Singular count) nouns prototypically function as nominal heads with a separate specifier. An instance of a word describing an action which functions as the head of a nominal does not defeat these base part of speech definitions. There is no claim that the criteria for membership in a part of speech or word class are exceptionless. Action words that are frequently used as the heads of nominals may come to have the status of a noun. In this case the action described by the word is construed objectively and the noun sense of the word is separately represented from the verb sense in the mental lexicon. There may even be languages in which all words describing actions are construed objectively and expressed as nouns or all words describing objects are construed relationally and expressed as verbs (Talmy, 2000). Languages provide a *base lexical construal* which reflects the prototypical, unmarked use of the words in the language. But grammar provides mechanisms for framing alternative construals, often reflected via syntactic and morphological marking.

Rejecting a purely formal basis for determining part of speech also implies that there are no purely formal structures. Categorizing a word as a noun or verb involves consideration of meaning and grammatical function in addition to form. By implication, any larger linguistic expression in which nouns and verbs participate also involves consideration of meaning and function, including such reputedly formal categories as noun phrase and verb phrase. Noun phrases are headed by nouns and typically specified by determiners. Verb phrases are headed by verbs and typically specified by auxiliary verbs, and the infinitive marker “to” (ignoring morphological specification). Using functional categories to describe the elements of noun and verb phrases is unproblematic, given their own functional basis. However, to the extent that noun phrases are necessarily

headed by nouns and verb phrases are necessarily headed by verbs, the important grammatical function of specifiers, as evidenced by the following contrasting examples, is ignored:

- (11) *The* dance *to* dance
- (12) *The* drink *to* drink
- (13) *The* kill *to* kill
- (14) *The* splash *to* splash
- (15) *The* farm *to* farm
- (16) *The* cat *to* cat (about)
- (17) *The* dog *to* dog (someone)
- (18) *The* father *to* father

The head has the same word form in each contrasting expression. There is little basis for the head determining the grammatical function of the expression. Rather, it is the specifier—either the determiner “the” or the infinitive marker “to”—that determines the grammatical function. The object specifier “the” picks out an objective (or noun) sense of “dance” and “drink” in forming a nominal, whereas the relational specifier “to” picks out an action (or verb) sense of these words in forming an infinitive clause. Even in the case of words which have a strong action preference, the object specifier “the” forces an object (or noun) reading as in the case of “the kill” or “the splash”. “The” has the effect of *objectifying* the following head, often forcing action words to be interpreted as one of the typical participants in the action, rather than the action itself. Likewise, “to” has the effect of *relationalizing* the following head. The words “cat” and “dog”—which are almost always used in expressions that refer to particular kinds of objects—are relationalized by “to” and the base meanings of “cat” and “dog” as categories of objects are extended to support reference to relational attributes of those objects and not the objects themselves.

In describing specifiers and heads as the poles of referential and relational meaning, it is implied that additional grammatical elements may surround these two poles and may be preferentially attracted to one or the other. In particular, there is an important grammatical function of *modification* that serves to constrain the range of referential and relational meaning as expressed in heads and specifiers. Also, when the relational pole is headed by a relational lexical item, the relational lexical item establishes conventionalized expectations for the occurrence of one or more *complements* to express the participants involved in the relation, resulting in the description of a situation as expressed by a *situation referring expression* or *clause*.

The focus of this paper is on the joint encoding of referential and relational meaning. The sentence

- (19) The book is on the table

and the nominal expression

- (20) The book on the table

have essentially the same relational meaning. They both describe a relation *on* existing between *a book* and *a table*. However, they differ in their referential meaning with 19 referring to a situation and 20 referring to an object. This difference in referential meaning is reflected in the grammatical realization of the two expressions.

2. Relational Pole Heads

Lexical items of numerous parts of speech and various expression forms can function as the heads of nominals and clauses. Section 2.1 considers the range of *lexical items* which can function as *nominal heads*. Section 2.2 considers the range of *lexical items* which can function as *clausal heads*. Section 2.3 considers the range of *expressions* which can function as *nominal heads*. Section 2.4 considers the range of *expressions* which can function as *clausal heads*.

2.1 Nominal Head (Lexical Item)

- (21) Noun
 - a. The *book*
- (22) Proper Noun
 - a. The *Donald*
 - b. The *Fillmores*
- (23) Verb
 - a. He gave the ball a *kick*
 - b. The *running* of the bulls
- (24) Adjective
 - a. The *quick* and the *dead*
 - b. The *noblest* of motives
- (25) Preposition
 - a. “It is the pause between, the no-man's land, the dark of light, the *in* of *out*, the light of dark, the *in-between*”
(<http://www.chabad.org/library/article.asp?AID=46080>)
- (26) Adverb
 - a. The *eyes* have it
 - b. They said their *good-byes*

Although it is uncommon for proper nouns to be preceded by a determiner in English and the expression “the Donald” has the effect of referring to a specific person even out of immediate context (namely Donald Trump), specifiers often precede proper nouns in other languages (Portuguese, German), reflecting the fact that proper nouns do not, in general, pick out specific individuals out of context. In “the quick and the dead” it may be argued that the heads of the nominals “the quick...” and “the dead...” are missing and must be recovered from the context. However, it may also be argued that an adjective can take on the function of a head when no other candidate is available. When an adjective functions as the head of a nominal, the effect is to objectify the adjective and construe it as referring to an individual or type of individual. Although not common in English except for superlatives like “the noblest,” which pick out a single object, the use of adjectives as the heads of nominals is very productive in Spanish (“el viejo”, “the old (one)”). The use of prepositions and adverbs as heads of nominals is not common in English, but such uses do occasionally occur.

2.2 Clause Head (Lexical Item)

- (27) Verb

- a. He *runs*
- b. He is *running*
- (28) Adjective
 - a. He is *sad*
- (29) Preposition
 - a. He is *out* (of the office)
- (30) Adverb
 - a. He is *there*
- (31) Noun
 - a. He is *president*
 - b. I am *home*
 - c. Jesus is *Lord*

Verbs are the typical heads of clauses. However, when there are two verbs in a clause as in “is” and “running” in “he is running,” which one functions as the head? Since the clause “he is running” is essentially about “running” and not about “being”, “running” is the obvious candidate to be the head—if the grammatical function *head* is to be semantically motivated. The common use of the term *auxiliary verb* to refer to “is” in sentences like “he is running” reflects its more peripheral role in the clause. On the other hand, it is the auxiliary verb which provides the tense that marks a tensed clause. Tense performs a referential function in identifying the situation being referred to with respect to the context of use of the text. When the referential and relational dimensions of meaning are distinguished, the functions of the auxiliary and main verb become clear. Once the referential function of the auxiliary verb is understood, the occurrence of relational heads that are not verbs in clauses becomes unproblematic. For example, “he is sad” is essentially about being sad, and “sad” functions as the head despite the occurrence of the auxiliary verb “is” in the clause. There are languages (Russian, Chinese) that allow adjectives to head clauses without an auxiliary verb to mark tense. It is a fact about English that relations other than verbs are uninflected for tense and must be accompanied by an auxiliary verb to provide that tense when they head clauses. And even main verbs like “go” are uninflected for tense in negative expressions like “he did not go”. The alternative treatment of “sad” as a complement of the auxiliary verb “is” with “is” functioning as the head (cf. Quirk et al., 1972, 1985) distorts the notion of what a head (and complement) is and is inconsistent with the treatment of “running” as the head of “he is running” or “run” as the head of “he did not run” (compare to “he is not sad”). If we allow adjectives to head clauses, then the conjoining of a verb and an adjective as in

- (32) He was *laughing* and *happy* (Grootjen, Kamphuis & Sarbo, 1999)

is unproblematic—two clausal heads are conjoined, rather than a verb head being conjoined with an adjectival complement. As Grootjen et al. note, many of the problematic cases of conjunction, which on the surface appear to involve the conjunction of different types of constituents, are resolved if it is grammatical functions that are conjoined and not the parts of speech or forms of expression of the constituents fulfilling those grammatical functions. Accepting that adjectives can head clauses, the extension to prepositions, adverbs and untensed relations more generally, is straightforward, as the above examples show. Likewise, although the use of a noun as the head of a clause is uncommon in English, it occurs more regularly in other languages (Russian). But what

does it mean for a noun to head a clause? Similar to the way that a relation which heads a nominal is construed objectively, a noun which heads a clause is construed relationally. This typically means making some attribute of the noun salient and ascribing that attribute to the subject of the clause. For example, in the expression

(33) He hounded his employees

The denominal “hounded” highlights an attribute of hounds (persistent pursuit) and ascribes that attribute to the subject “he” with respect to the object “his employees”. Generally, the use of a noun as the head of a clause results in such a large shift in meaning that a new lexical item is coined and a new verb created in the process (hence the use of the term “denominal”). For example, in the *nonce* expression

(34) The newspaper boy porched the newspaper (Clark, 1983)

a new word that describes the act of throwing a newspaper on a porch is coined. On the other hand, once coined, the new verb can be objectified and used in a nominal without essentially changing the meaning:

(35) The porching of the newspaper was precise

If this new word is used frequently enough, it will become part of the mental lexicon (as it is for me); otherwise, future uses will require reconstructing the meaning from construal processes activated by grammatical and lexical cues.

Although nonce words are unusual, the predication of an action in one sentence and the subsequent objectification of that action in a later sentence is quite common in discourse. Consider

(36) He kicked the ball. The kick was hard.

where the first sentence predicates a kicking situation and the second sentence objectifies that situation in order to refer back to it and provide additional detail. Not only verbs, but words of most any part of speech can be used in this manner. For example, in a paper on *Situation Awareness*, Endsley (1995, p. 46) discusses what a person knows and how they come to know it. Later she reifies the reference to “what” and “how”, stating “the individual knows *the what* but not *the how...the how* becomes occluded through the use of automatic processes but *the what* is still available to awareness” (italics added). In context, this reification of “what” and “how” flows quite naturally. Yet “what” and “how” are almost certainly not encoded as nouns in the mental lexicons of most speakers of English. The grammatical process of objective construal supports this use of “what” and “how”, not the encoding of these words as nouns in the mental lexicon.

2.3 Nominal Head (Expression)

There are numerous forms of expression that can function as the heads of nominals:

(37) Verb + Particle

a. The *buy out* of the corporation

(38) Poss -ing (i.e., possessive nominal + present participle) or gerund

a. Our *going to the movies* was fun

(39) That clause

- a. That *you like him* is nice

Several other researchers have suggested that any strong notion of endocentricity like that proposed in X-Bar Theory needs to be relaxed to deal with constructions like these. Pullum's (1991) article entitled "English nominal gerunds as noun phrases with verb phrase heads" is a classic example. Malouf (2000, p. 134) suggests that *verbal gerunds* (which correspond to Pullum's *nominal gerunds*) "show a mix of nominal and verbal properties that provide a challenge to any syntactic framework that assumes a strict version of X' theory". Borsley & Kornfilt (2000) discuss *mixed extended projections* "in which a verb is associated with one or more nominal functional categories". Borsley (2005, p. 463) provides arguments against the endocentric treatment of conjoined expressions noting that "recent work on 'constructions' has shown that languages appear to have a variety of exocentric structures". Some conjoined expressions functioning as the heads of nominals are shown below:

- (40) Conjoined prepositions
 - a. The *up and down* of the elevator
 - b. The *ins and outs* of society
- (41) Conjoined auxiliary verbs
 - a. The *dos and don'ts* of etiquette
- (42) Conjoined proper nouns
 - a. The *Fillmores and Kays*

It is commonly assumed that a good morphological test for (count) nouns is the ability to take a plural ending. Based on this test, it may be argued that "ins" and "outs", "dos" and "don'ts", and "Fillmores" and "Kays" are in fact (count) nouns. An alternative is to argue that the head of a nominal is capable of accepting the plural marker, whether the head is a (count) noun or other part of speech. When a preposition, auxiliary verb or proper noun (or conjunctions thereof) functions as the head of a nominal, the objective construal of the lexical item supports pluralization, and prepositions, auxiliary verbs and proper nouns need not be nouns when the function in such contexts. On this view, pluralization is not unique to count nouns. Words of other parts of speech (even mass nouns as in "the three rices are all nice") and different forms of expression (e.g., "buy outs" in "all these buy outs of corporations") may be pluralized when they head nominals. This argument demonstrates the relevance of the functional category *head of nominal* to morphology as well as syntax.

2.4 Clause Head (Expression)

Clauses may be headed by expressions as well as lexical items:

- (43) Nominal
 - a. He is *a child* vs.
 - b. He *is* a child
- (44) Prepositional phrase
 - a. The book is *on the table* vs.
 - b. The book is *on* the table
- (45) Verb phrase

- a. He is *eating a sandwich* vs.
- b. He is *eating* a sandwich

One analysis of “he is a child” treats “is a child” as a *predicate nominal*. Under this analysis the predicate specifier “is” has the effect of *predicating* the nominal “a child” and allowing the nominal (or salient attributes of the nominal) to be ascribed to the subject. However, there is also an *equational* analysis in which the auxiliary verb “is” is functioning as a main verb and equating two nominals “he” and “a child”. Both analyses are consistent with the basic principles of the bi-polar theory and humans make well vary in their linguistic representations of such constructions.

Two analyses are also possible for prepositional phrases. The question of whether the prepositional phrase “on the table” is functioning as the head of “the book is on the table” or whether the preposition “on” is the head taking the complements “he” and “the table” hinges on the integration of referential and relational meaning. If “on the table” is functioning as a referential unit that refers to a location, then the treatment of “on the table” as the head is supported. On the other hand, if the relation “on” is the focus of the clause, then the two complement relational representation is supported. English supports both possibilities as is evidenced by the question forms:

- (46) Where is the book?
- (47) What is the book on?

In (46) a location is explicitly referenced by “where”, whereas in (47) the object of the relation “on” is explicitly referenced by “what” and the reference to a location is less salient. On the assumption that a single representation is constructed during the processing of “the book is on the table”, one or the other will dominate depending on the context. Unlike the fully determinate X-Bar Theory, which posits that every expression will have a single syntactic representation, the bi-polar theory is underdetermined and multiple functional representations are possible for even simple expressions.

Many linguistic formalisms treat “eating a sandwich” in “he is eating a sandwich” as a verb phrase constituent and may even assume that every clause has a verb phrase constituent (at least in English). However, there are constructions in English which do not appear to contain verb phrase constituents. For example,

- (48) The man hit, and the woman kicked, the ball

provides evidence against the necessary existence of verb phrases. The combining of “the man” with “hit” and “the woman” with “kicked” before any combining with “the ball” is strongly suggested by this example. Insisting that “hit” first combines with “the ball” to form a verb phrase violates the strong form of the grammatical constraint. Further, the morphological marking of the subject on the clausal head (or clausal specifier) and the lack of (or optionality of) an overt subject in many languages (Spanish) argue against the necessary separation of the subject from the clausal head. More generally, Van Valin (2001) provides arguments against the cross-linguistic universality of verb phrase constituents in clause structure. For example, the mere existence of languages with Verb-Subject-Object and Object-Subject-Verb order argues against the universality of verb phrase constituents. His arguments are extended in this paper to claim that verb phrase constituents are not universal in English clause structure, either. This follows from the claim that the head of a clause can be an adjective, preposition, prepositional phrase,

adverb, noun or nominal in addition to being a verb. For example, if “sad” is the clausal head of “he is sad” with “is” functioning as a specifier, there is no verb phrase constituent.

If verb phrases are a possible, but not necessary, clausal constituent, then it is possible that “eating” can first combine with “is” rather than “a sandwich” in “he is eating a sandwich”. The combination of an auxiliary and main verb is called a *predicator*—consistent with the SPO (Subject-Predicator-Object) or SVO (Subject-Verb-Object) schema of functional grammar. Evidence for the existence of a predicator function is provided by tensed verbs which can function as predicators without a separate specifier (i.e., the specification is morphologically marked). The existence of tensed verbs as the grammatically simplest verb form in English provides strong evidence for the combining of the predicate specification and relational head in forming a predicator independently of any complements, and argues against the preferred, let alone universal, occurrence of verb phrase constituents. In “he ate a sandwich”, insisting that the tense of “ate” is separated out so that the verb phrase constituent “eat a sandwich” can be formed and then subsequently recombined with the tense marker is a violation of the strong form of the grammatical constraint.

Conjunctions provide additional evidence against the universality of the verb phrase constituent in English and in favor of the use of functional categories. Consider

- (49) The rock is *on* and *scratching* the table
- (50) The rock is *on the table* and *scratching it*
- (51) The rock *is on the table* and *was scratching it*
- (52) The rock *is on* and *was scratching* the table

In (49), a preposition and verb participle are conjoined independently of the object “the table” that they share. Functionally, two clausal heads are conjoined. In (50), the objects of the preposition and verb participle are distinct (albeit co-referential) constituents. The term *predication*—corresponding to an untensed clausal head and post-head complements—is used to indicate the grammatical function of “on the table” and “scratching it”. In (51), the *predicate* “is on the table” is conjoined with the *predicate* “was scratching it”, where predicate is a grammatical function corresponding to the tensed clausal head and post-head complements. In (52), the auxiliary verb, which indicates tense, and the clausal head are conjoined separately from the post-head complements, providing additional evidence for the grammatical function of a *predicator*. Finally, in

- (53) She is laughing, happy, a friendly person, and always in a good mood

the conjoining of a verb participle, adjective, noun phrase and prepositional phrase is explained by their common grammatical function as predications.

3. Referential Pole Specifiers

The previous section considered the range of lexical items and expression forms which can function as relational pole heads. This section considers the range that can function as referential pole specifiers. Lexical items of various parts of speech and at least one expression form may function as specifiers, as shown in the following two sections:

3.1 Nominal Specifiers

- (54) Determiner
 - a. *The* book
 - b. *A* book
- (55) Quantifier
 - a. *Some* books
- (56) Negative
 - a. *No* book
- (57) Wh-word
 - a. *What* book
- (58) Possessive pronoun
 - a. *My* book
- (59) Possessive nominal
 - a. *Joe's* book

The specifier in a nominal in combination with the head may indicate reference to a definite instance of an object (“the book”) or objectified relation (“the kick”), to a collection of instances (“some books”), to a mass (“some rice”), to an indefinite instance (“a book”), and even to a questioned instance (“what book”), and to a non-existent instance (“no book”). The possessive nominal, which consists of a nominal whose head combines with the clitic “’s”, indicates reference to an object with respect to a *reference point* (e.g., “Joe”), which is itself an object reference (Taylor, 2000).

3.2 Clause Specifiers

- (60) Auxiliary
 - a. He *is* running
- (61) Infinitive marker
 - a. I like *to* sleep
- (62) Complementizer
 - a. *That* he ran is good
- (63) Relativizer
 - a. The book *which* you read
- (64) Mood (subject + auxiliary)
 - a. *He's* going

The auxiliary verb “is” in “he is running” in (60) establishes reference to a definite situation via tense marking. The infinitive marker “to” in (61) typically specifies an indefinite situation. The infinitive clause can function as a complement in a matrix clause with the subject of the infinitive clause typically being provided by the matrix clause. The *complementizer* “that” in (62) objectifies the reference to a definite situation, allowing the situation to function as a complement in a matrix clause. The complementizer allows the situation to be construed objectively, similar to the way an object specifier objectifies a relational head. Complementizers in English are optional in contexts where the relation in the matrix clause subcategorizes for a clausal complement. Compare

- (65) I think (that) he likes you
- (66) *He likes you is nice

(67) That he likes you is nice

The verb “think” in (65) may be associated with a clausal complement (“that he likes you”), since one can think about a situation as well as an object. On the other hand, adjectives like “nice” are normally predicated of objects, not situations; hence (66) is not attested. The objectification of “he likes you” by the complementizer “that” in (67) supports the use of an objectified clausal complement as the subject of the predicate “is nice”. The *relativizer* “which” in (63) supports the use of a clause in a modifying role, rather than as a complement. In allowing a clause to function as a modifier, the reference of the overall expression is to the object referring expression expressed by “the book” as constrained by the modifying clause “which you read”. In “he’s going” in (64), the auxiliary verb “is” cliticizes with the subject “he,” forming a referential unit composed of a reference point (“he”) plus specifier (“’s”), and providing evidence for the grammatical function called *mood* in Halliday & Matthiessen (2004).

4. Integrating Morphology and Syntax

The bi-polar theory provides for a cleaner integration of morphology and syntax than uni-polar theories, which adopt a strong notion of endocentricity. Morphology is full of derivational suffixes that take a word of one part of speech and create a new word of a different part of speech.

Root	Derivational Suffix	Word
Adjective Quick	-ness	Noun Quickness
Adjective Quick	-ly	Adverb Quickly
Adjective Quick	-en	Verb Quicken

Table 1: Adding Derivational Suffixes to “Quick”

Despite the change in part of speech, the resulting word retains the essence of the root. The addition of “-ness” to “quick” has the effect of objectifying the adjective “quick” and allowing the concept it describes to be construed as a noun (i.e., objectively). The addition of “-ly” to “quick” allows the adjective, which normally functions to modify objective heads, to function to modify relational heads or relational modifiers—the typical function of an adverb. The addition of “-en” to “quick” adds a progressive aspectual dimension of meaning to the stative adjective “quick,” converting it into a verb.

There is no suggestion that “quick” in “quickness” is a noun because it is the root of “quickness” or that “quick” in “quickly” is an adverb or that “quick” in “quicken” is a verb. Yet this is essentially what is done in grammatical approaches which adopt a strong notion of endocentricity. Of course there are suffixes which do not change part of speech

(e.g., plural marker, tense marker) and there are grammatical forms in which the head is highly consistent with the expression of which it forms a part (e.g., noun head of nominal, verb head of clause). However, as Lyons (1968) notes, nouns do not have the same distribution as nominals and verbs do not have the same distribution as clauses, and a distributional definition of endocentricity will not work across lexical and phrasal categories.

In the case of nouns and nominals, it is because singular count nouns are not full referring expressions that their distribution differs from that of nominals:

- (68) The book is good
- (69) *Book is good
- (70) John's book is good
- (71) *John's the book is good

(69) is ungrammatical because the specification of the nominal "book" is missing. (71) is ungrammatical because the specification provided by the possessive nominal "John's" and the determiner "the" conflict.

In the case of verbs, untensed verbs and verbs without their complements cannot normally function as independent clauses and independent clauses cannot normally function as clausal subjects without the occurrence of a complementizer:

- (72) *running
- (73) *is running
- (74) The man is running
- (75) Running is fun
- (76) *Is running is fun
- (77) *The man is running is fun(ny)
- (78) That the man is running is fun(ny)

The reality is that neither morphology nor syntax is, in general, endocentric. Modification in grammar is the closest one gets to endocentricity. Heads combine with modifiers to form expressions that have essentially the same distribution as the unmodified heads. Complementation stretches the bounds of endocentricity and specification breaks endocentricity asunder.

Once a strong notion of endocentricity is rejected, the integration of morphology and syntax follows. Heads and roots are the primary meaningful elements of the expressions and word forms of which they form a part. However, heads are coerced by the specifiers, complements and modifiers with which they combine and roots are coerced by the affixes with which they combine. This coercion makes it possible for heads and roots to be used in different grammatical contexts.

5. Langacker's Conceptual Schema For Nominals and Clauses

Langacker (1991) provides a detailed Cognitive Linguistic description of the conceptual content of nominals and clauses which is closely aligned with the basic composition of referring expressions as described in the bi-polar theory. Langacker puts forward the following schematization of the conceptual content of nominals and clauses:

- (79) (G(Q(I(T))))

where G = *grounding predication*, Q = *quantifying predication*, I = *instantiating predication*, and T = *type specification*. A grounding predication grounds an expression in the context of utterance of the expression, where that context includes the speaker and hearer and the immediate environment of the speaker and hearer. The determiner in a nominal expression and the first auxiliary (or modal) verb in a clause function as grounding predications. A quantifying predication quantifies the number of discrete entities or events that are grounded by the grounding predication. In a nominal, the prototypical quantifying predication is a number like the number “two” in “the two books”. In the expression “some books,” “some” functions as both a grounding and a quantifying predication. Note that “two” may combine with a separate grounding predication (e.g., the determiner “the”) whereas, “some” does not. To distinguish these different uses of quantifiers, Langacker categorizes them into *absolute quantifiers* like “two” and *relative quantifiers* like “some.” A relative quantifier is relative to some *reference set* which is mutually understood between speaker and hearer. Thus, “some” represents a quantity relative to a reference set and grounds the quantity with respect to that reference set, whereas “two” is an absolute quantity independent of any reference set. Adverbs like “everyday” and “repeatedly” often function as quantifying predications in clauses. An instantiating predication instantiates an instance that may be further quantified and grounded in the context of utterance. According to Langacker (1991, p. 147), the head of a nominal (or clause) functions as an instantiating predication. Instantiation is different from grounding. Instantiation creates or identifies an instance of a type, but does not necessarily ground that instance in the immediate context of the speaker and hearer. Finally, the lexical item (or expression) that functions as the head of a nominal or clause provides a type specification which identifies the type of object or relation that the expression profiles. Thus, according to Langacker, the head of an expression minimally functions to provide both a type specification and to instantiate an instance of that type in the domain of instantiation (i.e., the space domain for nominals and the time domain for clauses). For nominals, this is true whether the head is singular or plural. If the head is plural, an instance of a collective type—what Langacker calls a *replicate mass*—is instantiated.

Langacker uses the functional categories *head*, *modifier* and *complement*—but not *specifier*—in describing how grounding, quantifying, and instantiating predications, and type specifications compose together. Essentially, the head is a linguistic element which combines with a modifier such that the head provides the profile of the composite expression. A modifier, then, constrains the type specification of the head, but does not provide the profile for the composite expression. The profile of the head projects to the composite expression, not the profile of the modifier. Absolute quantifiers function like modifiers in that the head they combine with provides the profile of the quantified expression. Langacker treats grounding predications specially in that they not only combine with heads, but, unlike other modifiers, they profile the head they combine with. Note that it is the head that a grounding predication profiles, not the grounding predication itself. Further, it is the addition of a grounding predication that results in a full-fledged nominal. According to Langacker, “the two components [grounding predication and head] have equal claim to the status of local head, since both their profiles correspond to the composite-structure profile (that of the nominal as a whole)” (1991, p. 147-8). With respect to nominals grounded by the determiner *the*, Langacker

states that “to the extent that *the* is regarded as the head, the other component—which elaborates the head—is a complement. To the extent that the elaborating structure is regarded as the head, *the* constitutes a modifier” (1991, p.147). In the (G(Q(I(T)))) schema, the parentheses reflect the order of composition, with the type specification first composing with the instantiating predication, which then composes with the quantifying predication and finally the grounding predication. Thus, a grounding predication presupposes a quantifying predication, which presupposes an instantiating predication, which presupposes a type specification. Each level of composition reflects a modifier-head or head-complement relationship. The order of composition is independent of the surface order of the linguistic elements and the elements may be morphological as well as syntactic.

In the bi-polar theory there is a fourth functional category called the *specifier*. The grounding predication typically corresponds to a *specifier* with the specifier functioning as the “referential head” of a composite expression (the quotes around “referential head” indicate the non-standard use of the term “head” in this expression). The specifier or “referential head” combines with the “relational head” (encompassing non-relational objects) to form a composite expression, with the “relational head” providing the type specification for the composite expression and the “referential head” projecting the referential type of the composite expression. The introduction of the specifier function avoids the need to view the “relational head” as a complement as suggested by Langacker. It allows the head (as opposed to a complement) to project the relational type—thereby, retaining a semantic basis for the notion of a head and at the same time maintaining a distinction between heads and complements (i.e., complements do not project relational type to composite expressions). It avoids the inconvenience of suggesting that “the” is the head of the expression “the book”—contrary to any semantic notion of what a head is.

The shift to function word—aka functional—heads in generative grammar and X-Bar Theory in the late 80’s (cf. Abney, 1987) is another example of a linguistic theory that largely ignores the semantic basis of headedness, leading McCawley in Cheng and Sybesma (1998, p. 27) to lament “...all sorts of things that to me are obvious modifiers now get represented as heads of things they aren’t heads of”. McCawley’s use of the term “modifier” indicates that he does not recognize the special grammatical function of determiners and auxiliary verbs. The distinction between specifiers and modifiers makes it possible to capture this grammatical function, without resorting to the treatment of determiners and auxiliary verbs as heads, but requires relaxing the notion of endocentricity which is central to X-Bar Theory.

Langacker is not the only cognitively or functionally oriented linguist to struggle with the functional status of determiners like “the”. Hewson (1992) and Hudson (1984) put forward arguments for the treatment of “the” as the head of simple phrases containing a determiner followed by a noun (e.g., “the dog”). Langendonck (1994) counters Hewson and Hudson with arguments for treating the noun as the head with the determiner being a dependent, but suggesting the possibility of a “mutual dependency”. Hudson (2004) reviews the arguments for both positions, concluding that a mutual dependency is indeed the right generalization and that either the determiner or noun may be the head, but not both (in a given expression). Hudson’s Word Grammar (a variant of Dependency Grammar) had already been extended to accommodate mutual dependencies in other

constructions, so this example of mutual dependency provides additional support for that extension. Further extending the mutual dependency into a distinction between the function of a specifier and a head, would bring Word Grammar into closer alignment with the bi-polar theory, but Hudson rejects the idea of a distinct specifier function, choosing to treat the determiner as a special kind of pronoun and subtype of noun, since the combination of a determiner and noun must constitute a noun in Word Grammar, which has no phrasal types. Langacker (1991, p. 51) agrees in part with Hudson in stating that “an expression of any size can be categorized as a noun and function as the head of a nominal”. However, Langacker (1991, p. 9) recognizes a distinction between nouns and verbs and nominals and finite clauses, noting that “nouns and verbs must be recognized as the two preeminent categories at the lexical level, while nominals (i.e., ‘noun phrases’) and finite clauses are equally universal and grammatically significant at a higher level of organization”. While it is possible for a frequently occurring expression to become lexicalized as a noun (i.e., represented as a unit in the mental lexicon), in general, this need not be the case and an expression functioning as the head of a nominal need not be a noun.

There is a close correspondence between Langacker’s grounding predication and the function of a specifier as the determinant of the referential type of an expression, and between Langacker’s type specification and the function of a head as the determinant of the relational type of an expression. Further, Langacker’s conception of modifiers as providing a higher order-type specification is entirely consistent with the function of modifiers in the bi-polar theory. Less clear is the correspondence between Langacker’s quantifying and instantiating predications and the functional categories of the bi-polar theory. The fact that a quantifier may function as a specifier (e.g., “two” in “two books”), or as a modifier (e.g., “two” in “the last two books”), or even as the head of an expression (e.g., “two” in “I want two”) argues against its treatment as a separate functional category. In this regard, a quantifier is more like a noun or a verb that can take on multiple functional roles, than it is a separate functional category, and the treatment of quantifiers as a part of speech as opposed to a higher level functional category is suggested. The quantifying predication may be encoded in multiple functional roles even within a single expression as in “these two books” where the specifier “these” indicates quantity as does the modifier “two” and the head “books.” Similarly, the grounding predication appears to be encoded in multiple functional roles as in the nominal “two books” where the specifier “two” provides an (indefinite) grounding predication and where the nominal “books” with the plural marker on the head also provides an (indefinite) grounding predication. However, Langacker argues that number marking on a head noun is part of the basic type specification with the head noun instantiating an instance of the basic type (i.e., a replicate mass when the noun is plural), and that number marking does not provide a quantifying predication (1991, p. 147). If Langacker’s argument is accepted, then quantifying predications and instantiating predications can be distinguished. Otherwise, assuming all nominal heads are marked for number and that number provides a quantifying predication, then nominal heads are quantified as well as instantiated and this distinction cannot be maintained. The bi-polar theory assumes that the number marking on heads supports a quantifying predication and, for plurals, a grounding predication, as well—deviating from Langacker in this respect. The ungrammaticality of the expression “*these book” reflects a conflict in the quantifying

predication provided by the specifier “these” (plural) and the head “book” (singular) and supports the idea that single count nouns provide a quantifying predication. However, the failure of single count nouns to function as full nominals (e.g., “book” in “*I like book”) reflects their lack of a grounding predication. On the other hand, plural count nouns provide both a quantifying and a grounding predication and can function as full-fledged (indefinite) nominals (e.g., “books” in “I like books”).

One way of integrating Langacker’s account of conceptual composition with the bipolar theory is to treat grounding predications, quantifying predications and type specifications as functional features that supplement the functional content of heads, modifiers, specifiers and complements. For example, in the expression “the book,” the word “the” is functioning as a specifier which provides a grounding predication, whereas “book” is functioning as a head which provides a quantifying predication and a type specification. Note that “the” (unlike “a”) does not provide a quantifying predication since it is consistent with both “the book” and “the books.” Schematically, we can represent the functional form of the expression as

(80) (Spec [G] (Head [Q,T]))

where [G] indicates that the specifier provides a grounding predication and [Q,T] indicates that the head includes a quantifying (i.e., singular) predication and a type specification. Figure 3 below uses a tree diagram to represent this schema in more detail:

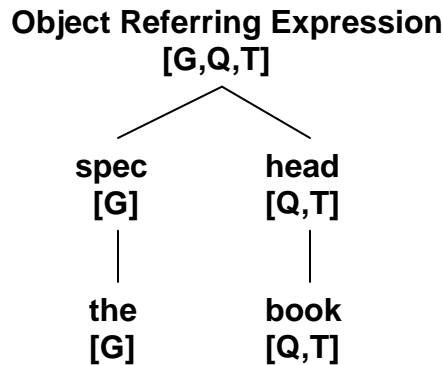


Figure 3: Adding abstract functional features

Note that [G] and [Q,T] identify abstract functional features of the specifier and head, but do not provide any details about those functional features. For example, Q indicates that the word “book” provides a quantifying predication without saying what that predication is—namely, singular. Likewise, “the” provides a grounding predication—namely, definite grounding. If we substitute these more concrete descriptions into the tree diagram, we have Figure 4, where [def] indicates the definite grounding predication of “the”, [sing] indicates the singular quantifying predication of “book” and [book] indicates the type specification.

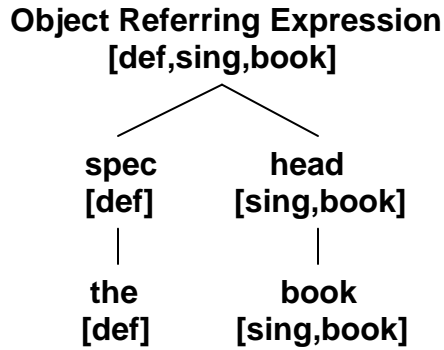


Figure 4: More specific functional features

In the bi-polar theory, functional features are a means of providing additional functional information at the level of abstraction represented by the functional categories head, modifier, specifier, and complement. An alternative to using functional features is to use subcategories of the basic grammatical functions. For example, the functional category specifier may be subcategorized as object specifier or predicate specifier and object specifier may be subcategorized as definite object specifier or indefinite object specifier. Alternatively, a feature notation may be used in which the more abstract specifier category is marked for the relevant functional features as in

- (81) specifier [obj, definite] vs. definite-object-specifier (e.g., “the”)
- (82) specifier [obj, indefinite] vs. indefinite-object-specifier (e.g., “a”)
- (83) specifier [pred, finite] vs. finite-predicate-specifier (e.g., “is”)
- (84) specifier [pred, nonfinite] vs. nonfinite-predicate-specifier (e.g., “to”)

These are really just alternative representations of the same functional content.

6. Summary

A specifier (or reference point plus specifier) and a head combine to form a referring expression whose referential type—nominal, clause, objectified clause, relative clause—is determined by the specifier (or reference point plus specifier) and whose relational type—relation, objectified relation, object—is determined by the head. The referential type determines the grammatical contexts in which the expression can be used.



Figure 5: The Referential Pole

A relational head (verb, adjective, preposition, adverb) combines with one or more complements to form a relational expression. In English, the first complement typically occurs before the relational head and functions as the subject. Up to three additional

complements may occur after the relational head depending on the nature of the relational head and the conventionalized expression of complements with which it is associated. These complements may function as direct object, indirect object, and relational complement. The bi-polar theory is highly schematic with respect to the expression of complements, which are typically specific to the preferences associated with individual relational lexical items. Unlike relational heads, if the head is an objective lexical item (noun, pronoun, proper noun), there is no expectation for the occurrence of any complements.

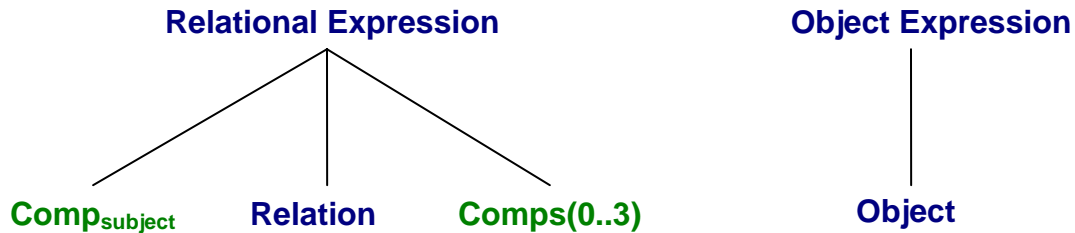


Figure 6: The Relational Pole

It is undetermined in the bi-polar theory whether a relational head combines with its specifier before or after the relational head combines with its complements. It is also undetermined whether the relational head combines with its non-subject complements before combining with the subject complement. This underdetermination allows the grammatical and wider discourse context, and, in spoken language, intonation, to influence the linguistic representation of clauses and nominals.

Modifiers and coordinators combine with all grammatical functions (GF_i) not just heads, with the grammatical function of the head or heads endocentrically determining the grammatical function of the modified or conjoined expression.

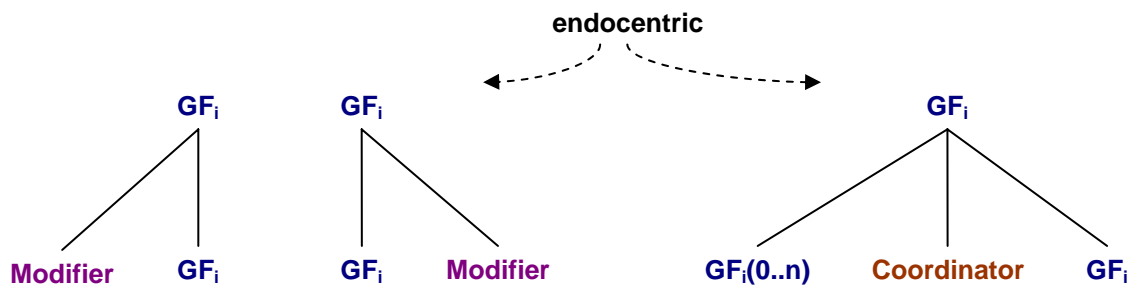


Figure 7: Modifiers and Coordinators

References

- Abney, S. (1987). *The English Noun Phrase in its Sentential Aspect*. PhD dissertation, MIT.
- Bloomfield, L. (1933). *Language*. New York: Holt, Rinehart & Winston.
- Borsley, R. (2005). Against ConjP. *Lingua*, 115, 461-482.
- Borsley, R. & Kornfilt, J. (2000). Mixed extended projections. In R. Borsley (Ed.), *Syntax and Semantics, Volume 32*, 101-131. New York: Academic Press.
- Cheng, L. & Sybesma, R. (1998). Interview with James McCawley, University of Chicago. *Glott International*, 3(5), 26-28.
- Chomsky, N. (1970). Remarks on nominalization. In R. Jacobs & P. Rosenbaum (Eds.), *Readings in English Transformational Grammar*, 184-221. Waltham, MA: Ginn.
- Chomsky, N. (1995). *The Minimalist Program*. Cambridge, MA: Ellis Horwood, The MIT Press.
- Clark, H. (1983). Making sense of nonce sense. In G. Flores d'Arcais & R. Jarvella (Eds.), *The Process of Language Understanding*, 297-331. New York: John Wiley.
- Cook, V. & Newson, M. (1996). *Chomsky's Universal Grammar, an Introduction*. Malden, MA: Blackwell Publishers.
- Dixon, R. (1991). *A New Approach to English Grammar, On Semantic Principles*. Oxford: Clarendon Press.
- Endsley, M. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors*, 37(1), 32-64.
- Givón, T. (1984). *Syntax: A Functional-Typological Introduction*. Amsterdam: John Benjamins Publishing Company.
- Grootjen, F, Kamphuis, V. & Sarbo, J. (1999). Coordination and multi-relational modeling: 'X and X' revisited. In 6th *Conference Annuelle sur le Traitement Automatique des Langues Naturelles* (pp. 345-351). Corse: Cargese.
- Halliday, M.A.K. & Matthiessen, C. (2004). *An Introduction to Functional Grammar, Third Edition*. New York: Oxford University Press.
- Hewson, J. (1991). Determiners as heads. *Cognitive Linguistics*, 2(4), 317-337.
- Hudson, R. (1984). *Word Grammar*. Oxford: Basil Blackwell.
- Hudson, R. (2000). Grammar without functional categories. In R. Borsley (Ed.), *The Nature and Function of Syntactic Categories*, 7-35. New York: Academic Press.
- Hudson, R. (2004). Are determiners heads? *Functions of Language*, 11(1), 7-42.
- Jackendoff, R. (1977). *X-Bar Syntax*. Cambridge, MA: The MIT Press.
- Jackendoff, R. (1983). *Semantics and Cognition*. Cambridge, MA: The MIT Press.
- Kornai, A. & Pullum, G. (1990). The X-Bar theory of phrase structure. *Language*, 66, 24-50.
- Langacker, R. (1987). *Foundations of Cognitive Grammar, Volume 1*. Stanford, CA: Stanford University Press.
- Langacker, R. (1991). *Foundations of Cognitive Grammar, Volume 2, Descriptive Application*. Stanford, CA: Stanford University Press.
- Langacker, R. (2000). Why a mind is necessary. In L. Albertazzi (Ed.), *Meaning and Cognition*, 25-38. Amsterdam: John Benjamins.
- Lyons, J. (1968). *Introduction to Theoretical Linguistics*. New York: Cambridge University Press.

- Malouf, R. (2000). Verbal gerunds as mixed categories in Head-Driven Phrase Structure Grammar. In R. Borsley (Ed.), *Syntax and Semantics, Volume 32* (pp. 133-165). New York: Academic Press.
- Pullum, G. (1991). English nominal gerunds as noun phrases with verb phrase heads. *Linguistics*, 29, 763-799.
- Quirk, R., Greenbaum, S., Leech, G. & Svartvik, J. (1972). *A Grammar of Contemporary English*. London: Longman
- Quirk, R., Greenbaum, S., Leech, G. & Svartvik, J. (1985). *A Comprehensive Grammar of the English Language*. London: Longman.
- Sells, P. (1985). *Lectures on Contemporary Syntactic Theories*. Stanford, CA: CSLI.
- Talmy, L. (2000). *Toward a Cognitive Semantics, Vols I and II*. Cambridge, MA: The MIT Press.
- Taylor, J. (2000). *Possessives in English*. New York: Oxford University Press.
- Van Valin, R. (2001). *An Introduction to Syntax*. New York: Cambridge University Press.
- Wierzbicka, A. (1988). *The Semantics of Grammar*. Amsterdam: John Benjamins.