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

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Abstract

Grammar encodes meaning. 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. Specifiers and heads combine to form *referring expressions* corresponding to the syntactic notion of a *maximal projection*. Lexical items and expressions functioning as *modifiers* are preferentially attracted to one pole or the other (and to other grammatical functions). If the head of an expression describes a *relation*, one or more *complements* may be associated with the head. The four grammatical functions *specifier*, *head*, *modifier* and *complement* are generally adequate to represent much of the basic structure and function of nominals and clauses. These terms are borrowed from X-Bar Theory, but they are motivated on semantic grounds having to do with their grammatical function to encode referential and relational meaning.

Introduction

Grammar encodes meaning (Wierzbicka, 1988). "Grammar is simply the structuring and symbolization of semantic content" (Langacker, 1987). 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 (Givon, 1984). "The main function of language is to convey meaning…the forms used for expressing meaning are motivated rather than arbitrary (where 'motivated' means that linguistic forms are not invented arbitrarily, but are, rather, already meaningful when they are introduced for some specific function)" (Heine, 1997). "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).

The above statements all support the position that there is (or should be) 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 would fail to capture the appropriate functional and semantic generalizations that allow us to make sense of linguistic form.

Linguistic representations of form and function are not complete representations of meaning. They are grounded in a *situation model* (Zwann & Radvansky, 1998), the psycholinguistic corollary of a *mental space* (Fauconnier, 1985) and a discourse based variant of *mental model* (Johnson-Laird, 1983). A situation model is a mental representation of the evolving situation described by a text or discourse. The situation model is a spatial-imaginal representation which is primarily non-linguistic (and non-propositional), although it can contain representations of linguistic content viewed as objects. Linguistic representations are restricted to representing those aspects of meaning which are lexically and grammatically encoded in language. The situation model corresponding to a linguistic description may elaborate that description in ways that are not explicitly represented in the linguistic form, and hence, which are non-compositional. Situation models, although important for a full representation of meaning, are not the topic of this paper.

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, 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 (referential and relation pole) combine to form a *referring expression*—in the example an object referring expression that refers to a type of object.

Contrast example 1 with

2. The kick

in which the specifier functions to identify an object referring expression even though the head 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 suppressed (or left unexpressed).

Construal is a basic cognitive process defined by Langacker (2000) as “our ability to conceive and portray the same situation in alternate ways.” With respect to language, he states that “linguistic elements – both lexical and grammatical – impose particular construals on the conceptual ‘content’ they evoke” and these construals are part of linguistic meaning. The use of a verb as the head of a nominal is an obvious example of construal, however, whether a word is prototypically a noun or a verb (in a given language) is a less obvious form of construal. Nouns are construed objectively and verbs

are construed relationally, but these *base construals* may be overridden by higher level grammatical construals.

In allowing relations to head nominals, English grammar provides a fairly general mechanism for construing relations as though they were objects. This is particularly true of lexical items 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 type.) Dixon (1992) 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, 1992, p. 337).

Besides relational lexical items functioning as heads of nominals, numerous types 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). An immediate consequence of the widespread occurrence of relational heads of nominals and verbal (and other types of) expressions heading nominals is that any strong notion of *endocentricity* wherein the head always determines the type of the larger expression in which it occurs (Bloomfield, 1933; X-Bar Theory—Chomsky, 1970; Dependency Grammar—Hudson, 2000) must be relaxed. The typical head of a nominal may be a noun, and the typical head of a clause may be a verb, but numerous other lexical and expression types may also head nominals and clauses.

It is important to distinguish the part of speech of a lexical item or the phrasal form of an expression from its grammatical function in any particular text. 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 confusion 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. A

better approach is to treat “running” as a present participle verb 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 (e.g. conjunctions in sentences like “she is smiling, happy, a friendly person and always in a good mood”) it is argued that purely syntactic representations fail to make the right grammatical generalizations and it is only in recognizing the grammatical functions of lexical items and expression forms that the appropriate generalizations follow (i.e. the preceding parenthetical example involves a conjunction of clausal heads even though the individual heads have different expression forms). The representations proposed in this paper integrate form and function in a manner that embraces the functional labels used by Chomsky in his linguistic descriptions of X-Bar Theory, but which are avoided in his purely formal notation. For example, in Chomsky (1995) he 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) is less circumspect in this respect, introducing the classic tree structure representation of X-Bar Theory:

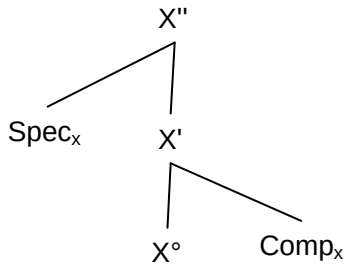

Figure 1: A variant of X-Bar Theory from Jackendoff (1977)

This tree structure representation effectively mixes the functional labels specifier and complement (as used by Chomsky) 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) 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 specifier and complement (and head) are functional labels, not syntactic categories. Sells (1985) uses the functional categories specifier, argument and modifier along with the formal categories X, X’ and X’’ in his representation, without acknowledging their functional status. In this paper, the functional status of specifiers and complements is recognized and explicitly represented. Further, X^0 as projected thru X’ and X’’ is functionally the head, and as Kornai and Pullum (1990) argue, “headedness” is a central element of X-Bar theory. Again, in this paper, the grammatical function head is explicitly represented. Finally, the term “adjunct”, which might be viewed formally as specifying a relative location, is replaced with the explicitly functional term “modifier” to complete the functional labeling used herein.

Rejecting a purely distributional 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. The base part of speech of a word is defined in terms of the prototypical

function of the word. Words that prototypically function as clausal heads in English are verbs, adjectives (predicate adjective) and prepositions (predicate preposition). Adjectives also prototypically function as modifiers in nominals (attributive adjective). Prepositions function as the heads of modifying prepositional phrases and as predicate modifiers (verb particles). Verbs (in English) have special inflectional forms like the present and past participle forms which distinguish them from adjectives and prepositions. With respect to semantic information, Dixon (1991) notes that "each major word class is essentially a grouping together of semantic types." Dixon adds that "many semantic types belong to the same word class in every language." For example, he cites the semantic type "MOTION" as universally a verb. At least some words that express motion will be categorized as verbs in all languages having a verb class. Cross-linguistically, "the [semantic] types are related to [word] classes in similar (but not identical) ways in different languages…Many semantic types belong to the same word class in every language. But for others there is quite a bit of variation." In English, words that prototypically function as nominal heads are nouns; words that prototypically function as full nominals are pronouns and proper nouns (which are further distinguished on the basis of their contextually dependent deictic function in the case of pronouns vs. their naming function in the case of proper nouns). Providing an example 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 presumed to be separately represented from the verb sense in the *mental lexicon*—the repository of entrenched words, expressions and constructions. There may even be languages in which all action words are construed objectively and expressed as nouns or all words describing objects are construed relationally and expressed as verbs (Talmy 2003). All languages provide a *base 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. For English, actions are prototypically expressed by verbs which function as the heads of clauses, and objects are prototypically expressed by nouns which function as the heads of nominals. However, in English, there are grammatical processes that support the use of nouns as the heads of clauses and verbs as the heads of nominals. The basic claim is that these processes do not automatically result in the creation of new entries in the mental lexicon. An action verb used as the head of a nominal does not necessarily result in the creation of a noun form of the verb (which is what a purely distributional analysis would require). The presence of an *object* or *nominal specifier* makes possible the use of a verb as the head of a nominal, and the presence of a *predicate specifier* makes possible the use of a noun (or nominal) as the head of a clause.

The important grammatical function of specifiers is evidenced by the following contrasting examples:

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, and there is no 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 specifier "the" picks out an objective (or noun) sense of "dance" and "drink" in forming a nominal, whereas the specifier "to" picks out an action (or verb) sense of these words in forming an infinitive phrase (or clause). Further, even in the case of words which have a strong action preference, the 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"—words 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.

As noted above, the referential and relational poles combine to form a referring expression. The combining of the referential and relational poles in creating a referring expression provides semantic motivation for the syntactic notion of a *maximal projection*. A relational pole alone does not constitute a referring expression and is not a maximal projection. However, there are lexical items in English (e.g. pronoun, proper nouns, deictic words, tensed verbs) that combine the referential and relational poles in functioning as referring expressions and constituting maximal projections. Further, there is no claim that the division of referential and relational meaning into distinct poles is universal and there may be languages in which this division does not occur or is not the unmarked grammatical form (e.g. Chinese). However, it is claimed that referential and relational meaning are two dimensions of meaning that are likely to be universally encoded by some mechanism in the grammar and lexicon of all languages.

Specifiers and heads are the key determinants of the bi-polar structure and function of nominals and clauses. The specifier functions to provide the locus of referential meaning and the head functions to provide the locus of relational meaning. In describing specifiers and heads as the loci or 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. Modification of heads is more typical in nominals and clauses, but an example of modification of specifiers will also be presented and modification of other modifiers and full referring expressions is also very common. In addition to modifiers, 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 four grammatical functions *specifier*, *head*, *modifier* and *complement* are generally adequate to represent much of the basic structure and function of nominals and clauses. These grammatical functions can be further subcategorized (e.g. *object specifier*, *predicate specifier*, *object modifier*, *relation modifier, subject complement, object complement, indirect object complement, clausal complement*) to explicate the structure and function of nominals and clauses in more detail. The general terms are borrowed from X-Bar Theory (Chomsky, 1970) where they are motivated on largely syntactic grounds. It is acknowledged that X-Bar Theory captures an important grammatical generalization, with the distinction between specifiers and modifiers representing an important advance in linguistic theorizing, but these categories are in need of semantic motivation which, when provided, necessitates certain modifications to the basic X-Bar schema (Ball, 2003).

The focus of this paper is on the joint encoding of the 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. In English, reference to a situation is typically expressed by predicating a relation functioning as the head (of a clause) and expressing the conventionalized participants of the relation as nominals functioning as the subject and object complements of the relation. The result is a situation referring expression or clause. On the other hand, reference to an object is typically expressed by an object referring expression or nominal which consists of a specifier and head and, in 20, an optional prepositional phrase modifier that constrains the referential and relational range of the expression. The requirements for the joint encoding of referential and referential meaning often lead to grammatical variation like that evidenced in 19 and 20.

Although this paper is focused on the encoding of referential and relational meaning, it is acknowledged that additional dimensions of meaning (e.g. salience, topic/comment, given/new) also compete for expression in full discourse contexts. According to Givon (1984), 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. For example, according to Givon, the discourse topic is typically encoded as the subject in English, as is the semantic agent of an action. However, when the discourse topic and agent do not coincide in a given sentence, grammatical variation (e.g., passivization or topicalization) results. While this work does address the meaningful consequences of grammatical variation resulting from trade-offs in the encoding of referential and relational meaning—as in the difference between the word “red” in “the book is red” and “the red book”—no attempt is made to provide a complete account of grammatical variation. To large extent, the encoding of referential and relational meaning will assume an unmarked or canonical ordering of lexical items. A more complete treatment will have to consider the representation of marked or

noncanonical forms of text and the encoding of discourse pragmatic aspects of meaning more generally.

Relational Pole Heads

Although a noun typically functions as the head of a nominal, and a verb typically functions as the head of a clause, lexical items of numerous parts of speech can function as the heads of nominals and clauses. Consider the following:

Nominal Head (Lexical Item)

- Noun
  - The *book*
- Proper Noun
  - The *Donald*
  - The *Fillmores*
- Verb
  - He gave the ball a *kick*
  - The *running* of the bulls
- Adjective
  - The *quick* and the *dead*
  - The *noblest* of motives
- Preposition
  - "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)
- Adverb
  - The *ayes* have it
  - 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 (e.g. Portuguese, German), reflecting the fact that proper nouns do not, in general, pick out specific individuals out of context. It has already been argued that verbs like "running" and "kick" can function as objectified heads of nominals. 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. The use of prepositions and adverbs as heads of nominals is not common in English, but such uses do occasionally occur.

Clause Head (Lexical Item)

- Verb
  - He *runs*
  - He is *running*

- Adjective
  - He is *sad*
- Preposition
  - He is *out* (of the office)
- Adverb
  - He is *there*
- Noun
  - He is *president*
  - I am *home*
  - 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. And once the referential function of the auxiliary verb is made clear, the occurrence of relational heads in clauses that are not verbs 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 (e.g. 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 verbs 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

21. He was *laughing* and *happy* (Grootjen, Kamphuis & Sarbo, 1999)

is unproblematic—two relational 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 (there is additional discussion of this topic in the section on expressions heading clauses). 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 (e.g. 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. In the case of a noun heading a clause, 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

22. 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

23. 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

24. 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 based on the use of basic construal processes. 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

25. 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* (a term closely associated with Situation Model), Endsley (1985) discusses what a person knows (i.e. their situation awareness) and how they come to know it. Later she reifies the reference to "how" and "why", 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 "how" and "why" flows quite naturally. Yet "how" and "why" are almost certainly not encoded as nouns in the mental lexicons of most speakers of English. It is the grammatical process of objective construal that supports this use of "how" and "why", not the encoding of these words as nouns in the mental lexicon.

Nominal Head (Expression)

In addition to lexical items of different parts of speech heading nominals, there are numerous forms of expression that can function as the heads of nominals:

- Verb + Particle
  - The *buy out* of the corporation
- Poss –ing (i.e. possessive nominal + present participle) or gerund
  - Our *going to the movies* was fun
- That clause

- That *you like him* is nice

Several other researchers have suggested that any strong notion of endocentricity like that proposed in X-Bar Theory (Chomsky, 1970) needs to be relaxed to deal with constructions like those above. Pullum's (1991) article entitled "English nominal gerunds as noun phrases with verb phrase heads" is a classic example (although Pullum no longer adheres to this position—personal communication). Malouf (2000) 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".

Some conjoined expressions functioning as the heads of nominals are shown below:

- Conjoined prepositions
  - The *up and down* of the elevator
  - The *ins and outs* of society
- Conjoined auxiliary verbs
  - The *dos and don'ts* of etiquette
- Conjoined proper nouns
  - The *Fillmores and Kays*

Borsley (2005) provides arguments against the endocentric treatment of conjoined expressions like those above noting that "recent work on 'constructions' has shown that languages appear to have a variety of exocentric structures."

It is commonly assumed that a good morphological test for nouns is the ability to take a plural ending. Based on this test, it may be argued that "ins" and "outs" in "the ins and outs of society", "dos" and "don'ts" in "the dos and don'ts of etiquette", and "Fillmores" and "Kays" in "the Fillmores and Kays" are in fact nouns. However, despite the plural ending and the function of these lexical items as the conjoined heads of nominals, they look just like the prepositions, auxiliary verbs and proper nouns from which they are derived. An alternative to categorizing them as nouns is to argue that the head of a nominal is capable of accepting the plural marker, whether that head is a 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 and other parts of speech and different forms of expression (e.g. "buy outs" in "all these buy outs of corporations") may be pluralized when they head nominals. If this argument is accepted, then it provides an example of the relevance of functional categories to morphology as well as syntax.

Clause Head (Expression)

Like nominals, clauses may also be headed by expressions

- Nominal
  - He is *a child* vs.

    - He *is* a child
- Prepositional phrase
    - The book is *on the table* vs.
    - The book is *on* the table
- Verb phrase
    - He is *eating a sandwich* vs.
    - 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 *predicatizing* 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 arguments "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 argument relational representation is supported. English supports both possibilities as is evidenced by the question forms:

26. Where is the book?
27. What is the book on?

In 26 a location is explicitly referenced by "where", whereas in 27 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 this text, one or the other will dominate depending on the context. Although many linguists prefer treating prepositional phrases as a unit in both syntactic and semantic representations (e.g. Jackendoff, 1983; Fillmore, 1968) some psychologists prefer propositional representations (Kintsch, 1998; Anderson, 1983; Ball, 1992) and often ignore reference to locations and directions in focusing on the relational dimension of meaning in their representational systems.

Although lexical items and expressions of numerous forms may head clauses, they share their grammatical function and examples like the following are unproblematic:

28. She is *laughing*, *happy*, *a friendly person* and *always in a good mood*
29. The rock is *on* and *scratching* the table
30. The rock is *on the table* and *scratching it*

In 28, a verb participle, adjective, nominal and prepositional phrase are conjoined. Despite the different lexical and expression forms, their conjunction is unproblematic since they are all functioning as the (conjoined) head of a clause. In 29, a preposition and verb participle are conjoined independently of the object "the table" that they share, whereas in 30, the objects of the preposition and verb participle are distinct constituents

with the object “it” of “scratching” anaphorically referencing the same object as the object “the table” of “on”.

In the expression

31 He is *eating a sandwich*

many linguistic formalisms treat “eating a sandwich” as a verb phrase constituent. But what is the referential and relational status of “eating a sandwich”? Referentially, the expression is missing the tense marking which would tie the expression to a specific situation. However, by comparison with the infinitive construction “to eat a sandwich” as in

32. To eat a sandwich would be nice
33. Eating a sandwich would be nice

it can be seen that “eating a sandwich” can function as an indefinite reference to a situation with an unspecified subject. Relationally, “eating a sandwich” is missing the subject complement, but once again there appear to be constructions in English which do not require overt expression of the subject. In sum, although verb phrases may be grammatical units in English, their incomplete relational and indefinite referential status argues against their being necessary elements of every clause. Not surprisingly, there are constructions in English which do not appear to contain verb phrase constituents. For example,

34. The man hit and the woman kicked, the ball

provides evidence against the necessary existence of verb phrases. In this example, “and” conjoins the two incomplete clauses “the man hit…” and “the woman kicked…”, with the object of the two clauses being provided by the single nominal “the ball” which occurs after the conjuncts. Further, the morphological marking of the subject on the clausal head (or specifier) and the lack of (or optionality of) an overt subject in many languages (e.g. Spanish) argue against the necessary separation of the subject from the clausal head. More generally, Van Valin (2001) provides convincing 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”, there is no verb phrase constituent. This contrasts with the more usual claim that “is” is the head with “sad” functioning as a complement. But claiming that “is” is the head and “sad” is a complement of “is” doesn’t result in a verb phrase constituent either since “is” provides the tense marking for the clause and verb phrases (as put forward in generative grammar) are unmarked for tense. The only way to get a verb phrase constituent out of “he is sad” is to separate out the tense from “is” and to allow the tenseless form “be” to function as the head and combine with the complement “sad” in forming a verb phrase. But this is a clear violation of the strong form of the grammatical constraint.

If verb phrases are a possible, but not necessary, clausal constituent, then it’s possible that “eating” can first combine with “is” rather an “a sandwich” in “he is eating a

sandwich". The combination of an auxiliary and main verb (more generally, relational head) will be called a *predicator*. A predicator refers to a relation independently of the participants in the relation. Evidence for the existence of a predicator function is provided by tensed verbs which can function as predicators without a separate specifier. For example, in

35. He ate a sandwich

The tensed verb "ate" functions as a predicator (referring expression) providing its own specification. The existence of tensed verbs as the most basic 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. Again, it is a violation of the strong form of the grammatical constraint to suggest 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.

Referential Pole Specifiers

The typical specifier of a nominal is a determiner, and the typical specifier of a clause is an auxiliary verb, however, like heads, there are a range of lexical items of different parts of speech and a few different forms of expression that may function as specifiers.

Nominal Specifiers

- Determiner
  - *The* book
  - *A* book
- Quantifier
  - *Some* books
- Negative
  - *No* book
- Wh-word
  - *What* book
- Possessive pronoun
  - *My* book
- Possessive nominal
  - *Joe's* book

The specifier in a nominal in combination with the head may indicate reference to a specific instance of an object ("the book") or objectified relation ("the kick"), to a collection of instances ("some books"), to a mass ("some rice"), to a non-specific instance ("a book"), and even to a questioned instance ("what book"), a non-existent instance ("no book") or a type ("a dog is a type of animal"). The possessive nominal indicates reference to an object with respect to a *reference point* which is itself an object reference (Taylor, 2000). The more specific term *object specifier* is used to refer to nominal specifiers. Reference in the bi-polar theory is to objects, relations and situations in a *situation model* (Kinstch, 1998; Zwann & Radvansky, 1998) which is a mental representation that may or may not correspond to actual objects, relations or situations in

the real world. An expression like “no books” in “no books are on the table” establishes reference to a collection of objects of type book, but indicates that the collection is empty in the situation model and does not correspond to any objects in the real world (cf. Kaup and Zwann, 2003). The negation is handled within the context of an object referring expression in accordance with the grammatical constraint rather than being propagated to the clausal level as is done in quantificational logic. Reference to the empty set or nil is quite common and quite functional in mathematics and computer programming. English goes further in supporting reference to empty sets or empty individuals of different types. Reference to typed variables is also very useful in mathematics and programming. English provides the wh-words used in combination with typed heads (e.g. “what book”) to support similar functionality.

Clause Specifiers

- Auxiliary
  - He *is* running
- Infinitive marker
  - I like *to* sleep
- Complementizer
  - *That* he ran is good
- Relativizer
  - The book *which* you read

The auxiliary verb “is” in “he is running” establishes reference to a specific situation via tense marking. In so doing, the situation referred to by the expression is predicated as actually occurring. The more specific term *predicate specifier* is used to refer to the specifier of a clause. In English, there is no distinction between predicate specification and situation specification for isolated clauses. The predicate specifier indicates reference to a relation and predicates that relation as occurring. The predicated relation when combined with its complements refers to a situation without additional specification. In general, it is assumed that the predicate specifier combines with the relational head before the relational head combines with its complements (making verb phrase constituents the exception rather than the norm). The predicate specifier combines with the relational head to form a *predicator referring expression* which refers to a relation. This predicator referring expression then combines with its complements to form a *situation referring expression* which refers to a relation along with its associated complements.

The infinitive marker “to” typically specifies a situation that is not predicated as actually occurring. This is essentially a generic reference to a non-specific instance or type of situation, rather than to a specific instance of a 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 lack of an explicit subject in infinitive clauses reflects an interaction between the encoding of referential and relational meaning. The non-specific nature of the reference of an infinitive clause may support omission of the subject, but there are likely to be other factors at work as well.

The *complementizer* “that” objectifies the reference to a specific 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. The difference is that the objectification

occurs after the complements to the relation have been integrated with the relation. Complementizers are optional in contexts where the relation in the matrix clause takes (or subcategorizes for) a clausal complement. Compare

36. I think (that) he likes you
37. *He likes you is nice
38. That he likes you is nice

The verb “think” may be associated with a clausal complement 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. The objectification of “he likes you” by the complementizer “that” supports the use of an objectified clausal complement as the subject of the predicator referring expression “is nice”.

The *relativizer* “which” in “the book which you read” 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”.

Morphological Specification

The referential function can be realized morphologically as part of the head as well as syntactically via a distinct specifier.

- Plural Marker
  - Book*s* are fun to read
  - *The* book*s* were fun to read
- Th-
  - *Th*e
  - *Th*is
- Wh-
  - *Wh*at
  - *Wh*o
- Third person singular
  - He run*s*
- Past Tense
  - He kick*ed* the ball
- Present Participle
  - He is kick*ing* the ball

The plural marker supports reference to a non-specific collection of objects (“books”) of a given type as is evidenced by the fact that plural nouns can function as full referring expressions. Additional specification is possible to further indicate reference to a specific collection of objects (“the books”). In general, singular count nouns do not indicate reference, although there are variants of English in which singular count nouns assume a referential function as in pilot communication and telegraphs where function words are dispensed with in the interest of conciseness:

39. One group *bullseye* 230 12 12 thousand

(One group of airplanes is 230 degrees and 12 miles from the bullseye at 12 thousand feet elevation)

where “bullseye” refers to a pre-established reference location. (Note the absence of relational terms as well in this example.) In English the letter groups “th-” and “wh-” are associated with the referential function of the lexical items of which they form a part. The present tense third person singular “-s” and past tense “-ed” markers on verbs indicate tense and function to provide a morphologically based specification. The present participle marker “-ing” functions similarly to the infinitive marker “to”. Like infinitive phrases, gerunds can function as complements as in

40. Going to the movies is fun
41. To go to the movies is fun

Also like infinitive phrases, gerunds cannot function as independent clauses without additional specification in most variants of English

42. He kicked the ball
43. *He going to the movies
44. *He to go to the movies
45. He is going to the movies
46. He is to go to the movies

This suggests that it is a feature of independent clauses that they are normally marked for tense indicating reference to a specific situation and that infinitive phrases and gerunds typically provide a referential function indicating reference to a non-specific situation which is not normally sufficient to function as an independent clause in English.

Integrating Morphology and Syntax

Having broached the topic of morphology, it is claimed that the bi-polar theory provides for a cleaner integration of morphology and syntax than approaches 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

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 it to be construed as a noun. The addition of “-ly” to “quick” allows the adjective which normally functions to modifies 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.

Note that 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:

47. The book is good
48. *Book is good
49. John’s book is good
50. *John’s the book is good

48 is ungrammatical because the specification of the nominal “book” is missing. 50 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 subject complements without the occurrence of a complementizer:

51. *running
52. *is running
53. The man is running
54. Running is fun
55. *Is running is fun
56. *The man is running is fun(ny)
57. 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 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. Despite this coercion, the resulting expressions and word forms retain the essence of the head and root, although the head and root are not the only contributors to the meaning of the overall expression or word form.

Modifiers

While specifiers and heads are important (and necessary) determinants of the basic character of referring expressions, modifiers play a more peripheral and optional role. In

particular, a modifier adds information that may serve to further refine the category of the head (and thereby help in determining the referent of the expression), but does not typically determine the base relational category or the referring category. For example, in the expression

58. The *old* man

the modifier "old" further refines the category "man", but does not establish the base category. "Old man" may be a subtype of "man", but "old man" is still a type of "man". Nor does the addition of "old" to "man" determine a referring expression.

There are also lexical items that can function to modify modifiers and in so doing they indirectly constrain the head of the expression. Consider

59. The *very* old man

in which the adverb "very" modifies the modifier "old" in further constraining the category to which this referring expression may refer.

Besides modifying heads and other modifiers, modifiers may also modify specifiers and full referring expressions. Essentially, modifiers may modify any grammatical function. Like specifiers and heads, lexical items and expressions of many different types may function as modifiers:

Relational Pole Modifiers (Lexical Items)

- Nominal Head Modifiers
  - Adjective
    - The *old* book
  - Quantifier
    - The *three* books
  - Noun
    - The *bird* dog
  - Proper Noun
    - A *Bin Laden* confidant
  - Verb Participle
    - The *running* bull
    - The *slaughtered* animal

Pre-head modifiers in nominals typically function to constrain the type of the head, perhaps creating a subtype, but the head determines the profile of the composite expression, not the modifier.

- Clause Head Modifiers (unspecified and specified head)
  - Adverb
    - He is *voraciously* eating the hamburger
    - He is eating the hamburger *voraciously*
  - Noun
    - He went *home*
  - Preposition
    - He went *out*
    - He is going *out*

- Clause Modifier
  - Adverb
    - *Unfortunately*, he left

In “he is voraciously eating the hamburger”, the location of “voraciously” between the specifier “is” and the head “eating” suggests the integration of “voraciously” with “eating” prior to the integration of “voraciously eating” with “is”. On the other hand, in “he is eating the hamburger voraciously” it is assumed that the modifier “voraciously” modifies the predicator referring expression “is eating”. In “he went out”, “out” modifies the morphologically specified verb “went” and the specification of tense is not separately represented from the tensed verb. Again, insisting that tense be separately represented from the main verb is considered a violation of the strong form of the grammatical constraint. The scope of adverbial modification in clauses is discussed in more detail in Ball (1992).

Relational Pole Modifiers (Phrasal)

- Nominal Modifier
  - Prepositional Phrase
    - The book *on the table*
    - His *in your face* manner
  - Relative Clause
    - The book *that I told you about*
- Predicate Modifier
  - Prepositional Phrase
    - He is running *on the track*
  - Nominal
    - He went *a mile*
- Clause Modifier
  - Prepositional Phrase
    - *On Tuesday*, he left

It is a basic claim of the bi-polar theory that post-head modifiers usually modify full referring expressions and not just the unspecified heads of those expressions. In “the book on the table”, “on the table” modifies the referring expression “the book” and not just the head “book”. In large part this claim is motivated by consideration of relational meaning. The arguments of a relation are referring expressions that refer to the participants in the relation. In “the book on the table”, the preposition “on” is a locative relation that relates the two arguments “the book” and “the table”. It is unclear from a relational perspective what it would mean for the arguments of a relation not to be full referring expressions, since the arguments would fail to indicate reference to the participants in the relation. Hence, from a relational perspective “the book” is an argument of “on” and not just the non-referential word “book”. On the other hand, from a referential perspective, “the book” refers to some object (of type “book”) and that reference is subsequently constrained by the modifier “on the table”. Despite the constraint imposed by the modifier, the expression as a whole refers to the same object as the unmodified referring expression. The modifier doesn’t change the referent of the expression, it just makes that referent more explicit. In sum, the integration of referential

and relational meaning is facilitated if post-head modifiers modify referring expressions and not just the unspecified heads of those expressions.

Pre-head modifiers like “red” in “the red ball” which occur between the specifier and the head do not modify full referring expressions. Instead of constraining a full referring expression, they constrain the type of the unspecified head of the expression, perhaps classifying that type into a subtype. The unspecified head is not an argument of the modifier, since the head is not a referring expression. In pre-head modification, the encoding of relational meaning is subordinated to the encoding of referential meaning and the relationship between a pre-head modifier and a head is essentially a modifier-head relationship resulting in a modified head and not a relation-argument (head-complement) relationship. The existence of both head-modifier and relation-argument relationships is acknowledged and it is suggested that they compete for encoding in supporting the expression of referential and relational meaning. The awkwardness of expressions like “the on the table book” in which “on” takes the argument “the table” and forms a higher-order relational expression that functions as a modifier of the head “book” reflects this competition. Hawkins (1984) presents a typological analysis of head-modifier and function-argument relationships, concluding that the head-modifier relationship is more universal: “statistical cross-categorial word order universals are most generally and economically definable in terms of a modifier-head rather than a function-argument theory”. But the claim that the head-modifier relationship is more universal across languages as an explanation of word order universals (i.e. modifiers either occur consistently before or after heads, for the most part, in a given language), does not mean that the relation-argument relationship can be dispensed with in any particular language, nor does it mean that both relationships may not be relevant to a particular language. In fact, English is an exception to the universal head-modifier tendency since there are both pre-head (“red” in “red ball”) and post head modifiers (“on the table” in “the book on the table”). Further, in order to maintain the universality of the head-modifier relationship, Hawkins must treat complements as modifiers, must ignore the subject, and must adopt a strong notion of endocentricity in treating the head of a phrase (e.g. N) and the phrase itself (e.g. N'') as being of the same category. By recognizing the grammatical categories specifier, head, modifier, and complement; by acknowledging the bi-polar nature of the specifier-head relationship which is exocentric with respect to the head; and, by realizing that the head-modifier relationship is distinct from the head-complement relationship, a better account of the relationship between form and meaning can be realized.

Referential Pole Modifiers

The referential function of a specifier need not be filled by a single lexical item. Predicate specification may include a modal auxiliary, a negative, and up to three other auxiliaries (and even an embedded adverbial modifier like “ever” in “he could not ever have done that” where “ever” modifies “not”). Consider the expression

61. The boy could not have been hitting the ball

In this example, the predicate specifier consists of the modal auxiliary “could”, the negative “not”, and the auxiliary verbs “have” and “been”. The modal auxiliary “could” is the locus of the predicate specification with “not” “have” and “been” functioning as

modifiers of “could”. This composite specification combines with the verb “hitting” to form a predicator referring expression.

The combining of the negative “not” with the modal auxiliary “could” is suggested by the contracted forms of negation (e.g. “couldn’t”, “shouldn’t”, “won’t”) and by the requirement for *do-support* in negation where the auxiliary verb “do” is inserted as the locus for attachment of the modifying negative (e.g. “he does not run” vs. “he runs”).

Object specification may also consist of more than one lexical item or morphological marker. Consider the expressions

62. books
63. two books
64. *first two books
65. the first two books

The word “books” by itself can function as an object referring expression or nominal (providing a morphologically based indefinite specification) as in “books are fun to read”. Adding the cardinal quantifier “two” constrains the range of the object referring expression, but does not change its grammatical status as an (indefinite) object referring expression as is evidenced by “two books are on the table”. On the other hand, the addition of an ordinal quantifier appears to change the grammatical status and “first two books” in “first two books are on the table” is not a well-formed object referring expression. If “first” is functioning as a modifier of the head “two books” this is unexpected, since a modifier does not change the grammatical status of the head it modifies (i.e. the modifier-head relationship is endocentric). However, if ordinal quantifiers function as modifiers of specifiers and not modifiers of heads, the awkwardness of example 64 is explained since there is no specifier for “first” to modify. In example 65, “first” in “the first” further constrains the definite reference indicated by “the” and “the first” combines with the indefinite expression “two books” to form a definite object referring expression.

Multi-word specification is presumed to be the norm, subject to certain limitations. A definite object referring expression cannot typically be further specified by an indefinite specifier and in most cases addition of a second definite object specifier is redundant (or would be inconsistent) (e.g. “these all books”). It is for this reason that further specification of definite object referring expressions is quite limited, although not entirely non-existent (e.g. “all” in “all these books” or “a” in “a Ronald Reagan of a politician”).

Complements

The final grammatical function to be discussed is the complement. A complement is itself a referring expression. However, it is not the head or specifier of the larger referring expression in which it participates. As such, it is not the determinant of the type of the overall referring expression (e.g. object referring expression, situation referring expression), nor is it the determinant of the type of thing to which the expression may refer. Although a complement profiles itself via its own head and specification, the profile of the complement does not project to the larger expression in which it participates.

The subject complement is the only complement of an *intransitive predicate* and the first complement of a *transitive predicate*. The direct object is the second complement of a transitive predicate or relational modifier (e.g., prepositional phrase modifier). Langacker (1991) defines the subject as the *primary figure* or *trajector* in a profiled relation and the direct object as the *secondary figure* or *landmark*. The trajector is the participant in a relation from which the relation "flows" and this flow is towards the landmark. The trajector is viewed as the source of the relation and the landmark is viewed as the target of the relation. Two additional complements are possible, the indirect object and an additional complement (i.e., in addition to the direct and indirect object). The indirect object occurs with relations like "give" as is the case for "Mary" in "he gave Mary the book." Langacker treats the indirect object as the secondary figure or primary landmark, demoting the direct object in such expressions to the status of secondary landmark. In double object constructions, the relation flows from the trajector thru the primary landmark (i.e., indirect object) to the secondary landmark (i.e., direct object). Thus, "Mary" has the status of primary landmark in the example above and "to Mary" has the status of secondary landmark in "he gave the book to Mary" with "the book" being the primary landmark. Clausal complements can function as trajectors (e.g., "that he likes you" in "that he like you is nice"), primary landmarks (e.g., "he likes you" in "I believe he likes you"), secondary landmarks (e.g., "he likes you" in "he told me he likes you") and even tertiary landmarks (e.g., "he likes you" in "I bet you $50 he likes you"). In the last example, the clausal complement constitutes a distinct functional category that cannot be subsumed under the other complement types (subject, object, indirect object).

The relationship between a head and its complements is primarily relational in nature. Only relational heads take complements and those complements are full referring expressions. The relational nature of a lexical item or expression and the number and type of complements it takes is a linguistic conventionalization of the situation that the lexical item or expression is used to describe. That conventionalization provides a particular perspective on the situation (Fillmore, 1977) that may vary from language to language (and within a language), but is nonetheless meaningfully motivated.

Over the course of a lifetime, humans acquire a large stock of relational schemas (or constructions) reflecting knowledge of the linguistic conventionalizations associated with relational lexical items (Ball, 1992). These relational schemas vary in their level of abstraction from completely lexically specific, to a mixture of lexically specific and non-lexically specific elements, to fully abstract without any lexically specific content. In general, language comprehension is facilitated by the *activation*, *selection* and *integration* of the most lexically specific schemas which correspond to the lexical input, since abstract schemas can only be indirectly activated by the lexical input and abstract schemas encode abstract meanings with abstract forms.

The number of distinct complements in a relational schema may be determined in part by psychological limits on the number of chunks of information that can be separately entertained at one time (i.e., short-term working memory limitations). The maximum number of complements that occurs in English clauses appears to be four as is demonstrated by the verb "bet" in

66. *I*$_1$ bet *you*$_2$ *five dollars*$_3$ *I win*$_4$ (Steedman, 2000)

Situation referring expressions may refer to situations involving more than three or four participants, but additional participants are left unexpressed or are expressed by relational modifiers as in “for five dollars” in

67. I sold him the car *for five dollars*

The ability to express additional participants in relational modifiers—overcoming short-term working memory limitations—only works if the preceding text can be chunked together in short-term working memory. In 67, this means combining “I”, “sold”, “him” and “the car” into a composite unit, before processing “for five dollars”. Once combined into a unit, “I sold him the car” can function as the first argument of “for” with “five dollars” functioning as the second argument. In this example, the modifying relationship of “for five dollars” with respect to the composite head “I sold him the car” and the relation-argument relationship between “for” and “I sold him the car” coincide. Although “for” takes the arguments “I sold him the car” and “five dollars” and forms a composite expression, “sold” (or “I sold him the car”) and not “for” is the head of the composite expression (as reflected in the modifying relationship). Whereas a complement is integrated into an existing relational schema

|Subj *sold* Iobj Obj| → |$\mathbf{I_{subj}}$ *sold* $\mathbf{him_{iobj}}$ the $\mathbf{car_{obj}}$|),

a modifier introduces its own relational schema

|Pred *for* Obj|→ ||$\mathbf{I_{subj}}$ *sold* $\mathbf{him_{iobj}}$ the $\mathbf{car_{obj}}$| *for* five $\mathbf{dollars_{obj}}$|

which is integrated with an existing relational schema.

The relationship between a specifier and a relational head and between a relational head and its complement(s) is largely, though not entirely, orthogonal. The specifier-head relationship is primarily referential, whereas, the head-complement relationship is primarily relational. Grammatically, there is often a closer affinity between a specifier and a relational head than there is between a relational head and its complements. For example, a predicate specifier combines with a relational head to form a predicator referring expression and a predicator referring expression combines with its complements to form a situation referring expression. The closer affinity of a predicate specifier and relational head is suggested by the fact that the infinitive marker “to” which specifies a non-finite predicator referring expression, also sanctions the non-occurrence of the subject complement as in the infinitive phrase “to go” in the clause “I want to go” (an example of the interdependence of referential and relational meaning). Although the infinitive marker sanctions the non-occurrence of the subject complement, that complement is typically retrievable in the context of use of the expression. On the other hand, in the expression “the book is on the table” the relationship between the predicate specifier “is” and the relational head “on” may be subordinated to the relationship between “on” and its object complement “the table.” If so, “on” first combines with “the table” to form a higher order relation (that takes one less complement) before combining with the predicate specifier “is” (and the subject complement).

Complements can be contrasted with modifiers. Complements are sanctioned by the relational elements they combine with to form composite expressions via the relational schemas evoked by the relational element. Complements are typically obligatory elements of the expressions they occur in—although a relational element may license alternative schemas in which the complement does not occur. Modifiers are not

sanctioned by a relational element and are always optional (except perhaps in idiomatic schemas). Complements are referring expressions. Modifiers may or may not be referring expressions. The typical complement is a non-relational object referring expression. The typical modifier is a relational expression (e.g., attributive adjective, prepositional phrase, or adverb). A complement profiles itself, although the profile of the complement does not project to the composite expression. It is the relational head with which the complement combines that projects the profile and type of the composite expression. A modifier profiles the head it modifies and does not project the type of the composite expression (although it may constrain that type into a subtype). Thus, neither a complement nor a modifier projects the type of the composite expression.

Although the distinction between a prototypical complement and a prototypical modifier is clear cut, the distinction is somewhat fuzzy at the boundaries. Jackendoff (1977) lumps complements and modifiers together noting that "if we classify complements on semantic grounds, we find that there are three distinct ways in which a complement may be integrated into a semantic interpretation: as a functional argument, as a restrictive modifier, and as a nonrestrictive modifier." In the bi-polar theory, complements are restricted to being functional arguments. Numerous linguistic treatments that do distinguish complements from modifiers suggest that nouns or nominals can subcategorize for complements, often citing "of" phrase like "of matches" in "a book of matches" as clear examples of complements. The occurrence of the preposition "of" in these complements is argued to be of no import even though the expressions are ungrammatical without it. However, if complements correspond to the participants in a relation, then non-relational linguistic elements like "book" or "a book" do not take complements. It is because these elements do not take complements that the preposition "of" is required to introduce a prepositional phrase modifier. Chomsky (1970) provides a list of examples of noun phrases which he describes as "determiner-noun-complement" constructions (e.g. "the weather in England", "a house in the woods"). But in each case a preposition or other relational lexical item is required to introduce what he calls the complement. The requirement for a relational element to introduce the modifying expression combined with the non-relational status of the head noun argue against the treatment of the modifying element as a complement. Some of Chomsky's examples are quite formulaic (e.g. "the prospects for peace") and it may be that the noun head evokes the entire expression, but this evocation reflects a relationship between a lexical item and a formulaic expression, and not a relationship between a nominal head and a complement. Just as it is possible to recognize a lexical item given only partial "infrmtion", so it is possible to recognize a formulaic expression given only part of the expression (e.g. "go break a …").

Prepositional phrases can function as complements if sanctioned by a relational head. The expression "on the table" functions as a complement in "he put the ball on the table" and a modifier in "the ball on the table". The complement status of "on the table" in the first expression stems from the fact that the verb "put" sanctions a locative complement, whereas the nominal "the ball" does not. In the expression "he gave Mary the ball," "Mary" is a complement of "gave," whereas in "he gave the ball to Mary," "to Mary" may or may not be a complement. The treatment of "to Mary" depends on which schema is used to construct a representation. Assuming a schema for "gave" like **|subj *give* obj comp|** which includes an additional complement following the object, "to Mary"

can be instantiated as that complement. However, there may also be a more specialized schema like |**subj *give* obj *to* obj**| which explicitly represents "to" and only abstracts from the object of "to". In this schema, "to" participates as part of the relational head "give…to" similar to the way verb particles contribute to relational heads, but "to" also sanctions an additional object (unlike verb particles). This more specialized schema is likely to be preferred over the more abstract schema which treats "to Mary" as a complement. In general, multiple representations of a given text are possible depending on which schemas get activated and integrated during the construction of a representation. For example, in

68. He painted the building blue

If the |**subj *paint* obj**| schema is retrieved when "painted" is processed and the |**head mod**| schema is retrieved when "blue" is processed (in the context of "he painted the building"), then the resulting integrated representation will have the form

||**he**$_{\textbf{subj}}$ **painted**$_{\textbf{head}}$ **the building**$_{\textbf{obj}}$ **| blue**$_{\textbf{head-mod}}$|

with "blue" functioning as an atypical relational head modifier that modifies "painted". In this representation, "blue" is effectively functioning as a manner adverbial. Such a representation is suggested by the question "how did he paint the building?" for which "he painted the building blue" is a reasonably suitable response (although "he painted the building with a paint brush" sounds better). That adjectives can function as predicate modifiers in some expressions should not be surprising, although this is not a typical function of adjectives. On the other hand, if a more specialized schema of the form

|**subj *paint* obj color**$_{\textbf{comp}}$|

is selected—where "color" is essentially a specialized complement of paint—then a representation of the form

|**he**$_{\textbf{subj}}$ **painted**$_{\textbf{head}}$ **the building**$_{\textbf{obj}}$ **blue**$_{\textbf{color-comp}}$|

is supported and "blue" is functioning as an atypical complement sanctioned by the specialized schema. When functioning as a complement, "blue" has the status of a referring expression despite the lack of an overt specifier. Such a representation is suggested by the question "what color did he paint the building?" for which "he painted the building blue" is a reasonable response.

Many relational expressions participate in schemas with a reduced number of complements as in the expression "he bet me" which is missing the second object and clausal complement that occur in the fully explicated schema. In such schemas, the participants which are explicitly encoded, are more salient than the missing participants. It is even possible for all participants in a relation to be excluded, in which case only the relation itself is salient. This is what happens in object referring expressions with relational heads where all complements are left unexpressed as in "the bet was late" (where "bet" refers to the act of betting and not the amount of the bet).

It may also be the case that multiple schemas may be integrated with the effect of adding complements to a base schema. In the expression "he sneezed the napkin off the table" (Goldberg, 1995), the base intransitive schema for "sneeze" |**subj *sneeze***| may be integrated with the more abstract schema |**subj head obj direction**| activated by the processing of "the napkin" and "off the table" in the context of "he sneezed" and leading

to **|he$_{subj}$ sneezed$_{head}$ the napkin $_{obj}$ off the table $_{direction}$|**. The **|subj head obj direction|** schema is less abstract then the causative construction put forward by Goldberg, providing only the needed object and directional complements and leaving the notion of causation implicit.

From a relational perspective, the subject complement has the same status as the other complements of the relation. However, many linguists treat the subject as distinct from other complements, according it the status of *external argument* (i.e. external to the verb phrase which includes object complements, but not the subject or tense marking). Treating the subject as an external argument of the clausal head does have some merit. In part, this treatment is motivated by the occurrence of subjectless (and tenseless) constructions like gerunds and infinitive clauses which suggest the existence of verb phrase constituents. There are also pragmatic reasons for treating subjects as distinguished from other complements (e.g. topicalization, saliency, etc). From a referential perspective, the subject typically refers to a previously introduced referent, providing a *reference point* (Taylor, 2000) that ties the subsequent text (typically a clause) to the evolving situation model. If this reference point is distinguished from the rest of the clause, then the basic subject-predicate division of the clause emerges. From this perspective, the relational meaning of the clause is less transparent, having external (e.g. subject) as well as internal (object) arguments.

There are clausal forms in English in which the separation into subject and predicate is not warranted on grammatical grounds in accordance with the strong form of the grammatical constraint. For example, in example 69 below, the referential specification provided by the subject combines grammatically with the referential specification provided by the auxiliary verb and this combination is grammatically distinct from the remainder of the clause:

69. He's eating
70. He ate

If we call the referential specification provided by the subject the *reference point*, and the referential specification provided by the auxiliary verb the *reference marker*, then in some constructions the reference point and reference marker can combine grammatically in providing the referential specification for the clause. In such constructions, what is the functional status of the remainder of the clause? Structurally, when the head is a verb, the remainder of the clause has the form of a verb phrase, where the verb phrase consists of the untensed verb and post-head complements (excluding the subject). Functionally, the verb phrase functions as an indefinite situation referring expression which is not fixed in time and for which the subject is not indicated. The term *predication* is suggested to indicate this grammatical function, leaving the term *predicate* to indicate the grammatical function corresponding to a definite situation referring expression with a tensed auxiliary or main verb, but lacking a subject, as in "ate" in example 70.

The introduction of the grammatical functions reference point, reference marker (i.e. specifier), predication and predicate to indicate the referential elements of clauses contrasts with the relational structure of a clause which consists of a subject complement, relational head and zero or more non-subject complements. In the end, it may be that a full integration of referential and relational meaning is not possible and the basic form and function of a clause may have both a referentially based subject-predicate form (where the subject is functioning as a reference point) and a relationally based subject-

head-object form (cf. Ball, 2005). Although this may be a theoretically inelegant result, it does capture the basic insight that both the subject-predicate and SVO descriptions of English clause structure may be valid. Whether or not humans actually build representations which reflect both these viewpoints simultaneously, or prefer one viewpoint over the other is presumably an empirical question that cannot be resolved on purely theoretical grounds.

Interim Summary

The following graphic summarizes the representational commitments of the bi-polar theory:

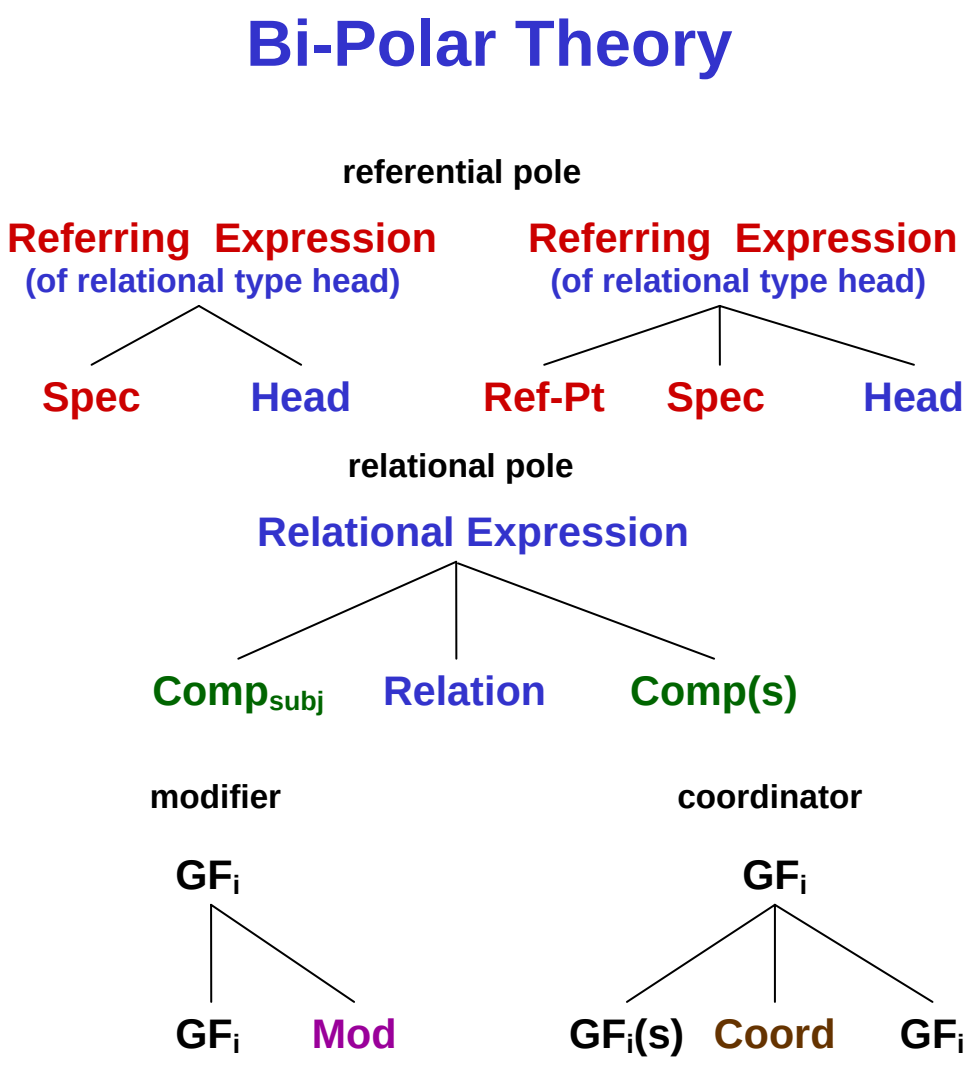

Figure 2: The Bi-Polar Theory

A specifier and a head combine to form a referring expression whose referential type is determined by the specifier and whose relational type is determined by the head. The

referential type of the referring expression determines the grammatical contexts in which the expression can be used. In a nominal, a determiner typically functions as the specifier, and a noun typically functions as the head. Pronouns and proper nouns do not require separate specification since they are construed referentially (in English). In a clause, an auxiliary verb frequently functions as the specifier and relational lexical items (e.g. verb, adjective, preposition) frequently function as the head. In clauses with tensed verbs, the tensed verb provides both the referential and relational specification for the clause. The referential specification may also include a reference point (Ref-Pt in Figure 2) that ties the current text to the evolving situation model. In a possessive nominal like "John's book", "John" functions as a reference point, identifying a previously introduced referent, which combines with the object specifier "'s" in providing the specification for the nominal head "book". In clauses, the subject functions as a reference point which may or may not combine with the predicate specifier in providing the referential specification for the clause. For example, in "He's eating", the subject as reference point combines with the auxiliary verb in providing the referential specification for the clause. On the other hand, in "He ate", the referential specification provided by the tensed verb "ate" does not combine with the subject functioning as a reference point before combining with the relational head "eat". The subject need not always function as a reference point. In question forms like "Where is he going?", "where" provides the reference point, not the subject "he". How such questions forms are represented in the bi-polar theory is not fully resolved. Does "he going" form a functional unit, something akin to a *proposition* (i.e. a clause lacking only tense), or is the subject "he" separately represented from the predication "going"?

The combining of a specifier with a head in forming a referring expression is (largely) orthogonal to the combining of a relation with its complements. It is undetermined in the bi-polar theory whether a relational head combines with its specifier in forming a predicator before or after the relational head combines with its complements. It is also undetermined whether the relation combines with its non-subject complements before combining with the subject complement. It is an open question whether or not referential and relational meaning are fully integratable (i.e. representable as a tree with a single root node). It may be that referential and relational meaning are tied together at specific functional elements like the subject without being fully integrated. For example, the subject may function as a reference point in a referential schema and as the subject complement in a relational schema, with the referential and relational schema not being integrated otherwise.

The generalized relational schema depicted above fails to provide an adequate account of the number and type of complements conventionally associated with relational lexical items. Humans have available a large stock of constructions or schemas at multiple levels of abstraction and generalization that fill in the details of this overly general schema for relational structure. The basic commitment is that at some level of abstraction, the grammatical functions put forward in this paper will form elements of these constructions.

A key claim of the bi-polar theory is that modifiers and coordinators combine with all grammatical functions (GF_i) not just heads. The behavior of modifiers and coordinators requires consideration of the grammatical function of the expressions being modified and coordinated, with the head being only one of several possible grammatical

functions that can be modified or coordinated—the others being (at least) specifier, modifier, complement and referring expression.

X-Bar Theory

The meaning based definitions of specifier, head, modifier and complement used in the bi-polar theory can be contrasted with the syntactic based definitions of these terms in X-Bar Theory (Chomsky, 1970; Jackendoff, 1977). In X-Bar Theory there are typically three levels of syntactic representation: (1) the base or minimal level (X°) corresponding to a lexical category, (2) an intermediate or non-minimal level (X'), and (3) a maximal level called the maximal projection of the head (X" or XP). The head is the lexical category (e.g., N, V, Adj, Prep) for which the variable X is a generalization (ignoring function word heads for now). At each level in the representation, X corresponds to the same lexical category and the head is said to project that lexical category from X° thru X' to X". Specifiers are defined configurationally with a description like "daughter of the maximal projection (XP) which is sister to a non-minimal head (X')." The configural definition of specifiers is widely accepted and specifiers are typically considered to be purely syntactic, making little or no contribution to meaning. It has even been argued that the purely syntactic nature of specifiers provides evidence for the independent reality of syntax. Complements are defined configurationally as the linguistic elements which combine with a head (X°) to form a non-minimal head (X'). Modifiers (or adjuncts), to the extent that they are defined in X-Bar Theory, are linguistic elements which combine with heads without changing the level of the head. Viewed graphically (and ignoring modifiers), X-Bar Theory posits the following basic structure (derived from Jackendoff, 1977, and Sells, 1985):

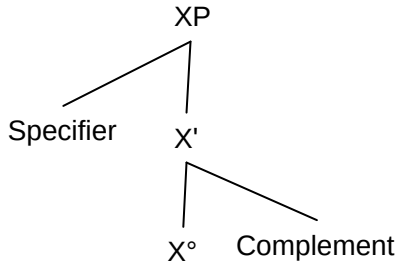

Figure 3: A common, simplified variant of X-Bar Theory

This is a common tree based description of X-Bar Theory. However, the functional categories specifier and complement are defined configurationally in more circumspect descriptions (Chomsky, 1995). It is accepted that X-Bar Theory captures an important grammatical generalization, but the bi-polar theory provides a semantic basis for this generalization and motivates the use of functional labels as opposed to configurational representations of grammatical function. This semantic basis helps avoid some of the pitfalls that have befallen various versions of X-Bar Theory. For example, the confusion over whether Tense (or Inflection) or V is the head of a predicate (i.e., VP or IP or TP) stems from the assumption that the head must project the syntactic category of the predicate. But if this is true, then Tense must be the head of the predicate as is assumed by Chomsky (1995) since Tense is assumed to project the syntactic type of the predicate.

On the other hand, V is the central relational element of the predicate, with Tense filling a more peripheral role. V has a semantic prominence that does not hold for Tense. This leads Jackendoff (1977, 2002) to assume that V is the head of the predicate and not Tense. Similarly, for COMP. If COMP projects the syntactic type of a clause (i.e., CP or S), then COMP must be the head according to Chomsky (1995). But COMP is clearly a peripheral (and optional) element of a clause with V being the central relational element. Recognizing that the role of a specifier and the role of a head are distinct, and equating syntactic type with the function of the specifier (i.e. referential meaning), it is easy to see that Tense projects the referential type of the predicate, whereas V projects the relational type of the predicate. Similarly, COMP projects the referential type of a complement clause whereas V projects the relational type of the clause. The optionality of COMP reflects the fact that clauses have a default referential type (i.e., situation referring expression), but that default can be overridden by a complementizer as in "*That* he likes you (is nice)" (i.e., objectified situation referring expression).

In a similar confusion, Abney's (1987) *DP Hypothesis* posits that determiners head determiner phrases (i.e., what are traditionally called noun phrases) with the determiner subcategorizing for a noun phrase complement. In the expression "the man," "the" heads a determiner phrase (DP) with "man" functioning as an NP complement. However, there is a basic problem with this hypothesis. The type of object referred to by a DP is determined by the noun which heads the noun phrase complement (using Abney's terminology) and not the determiner. Thus, the complement must project the type of object. However, the idea that a complement can project the type of the expression it is embedded in runs counter to the whole notion of what a head and complement are. The general direction in X-Bar Theory of treating functional elements like I (Inflection), T (Tense), D (Determiner), and C (Complementizer) as the heads of phrases like IP, TP, DP and CP leads McCawley (in Cheng and Sybesma, 1998) to lament "…one of the things that annoys me about syntactic categories as they're treated in real recent MITish stuff is that it's really become hard for MITish people to say 'modifier' anymore. I mean, all sorts of things that are to me obvious modifiers now get represented as heads of things they aren't heads of."

Abney (1991) relies on the introduction of semantic heads or s-heads to distinguish content-based heads from functional heads. "Intuitively, the s-head of a phrase is the most prominent word in the phrase" (ibid., p. 2). Abney's s-head comes close to the notion of head used in the bi-polar theory—although his treatment of the noun head of the object of a preposition as the s-head of the prepositional phrase contrasts with the bi-polar treatment in which the preposition is the head of the prepositional phrase. Distinguishing s-heads from functional heads improves on the DP Hypothesis, but still leaves open the problem of projecting the type of the expression from the embedded s-head complement. Further, treating a word like "man" in the expression "the man" as an NP complement and maximal projection, distances the notion of maximal projection from referring expression and introduces a phrasal level of representation where none is needed except to meet the syntactic requirement that complements are maximal projections.

Cann (1999) puts forward a syntactically based dual-head proposal in which the specifier is treated as a secondary head with both the specifier and the head projecting features. Cann's syntactic treatment comes close to that of the bi-polar theory, although

his approach is not semantically motivated and he does not adopt a referential basis for distinguishing the role of the specifier from the role of the head.

In the version of X-Bar Theory diagrammed in Figure 3, a single complement combines with the head and it is unclear how multiple non-subject complements should be treated. From a relational perspective, this variant of X-Bar Theory is too restrictive. Relational elements may relate multiple arguments, with transitive relational elements including transitive verbs being prototypical, but with verbs like "bet" taking as many as three non-subject complements. Jackendoff (1977) and Chomsky (1995) deal with this by allowing the complement to contain multiple constituents, including multiple complements. In their variant, X-Bar Theory has nothing to say about the number and type of non-subject complements and it is up to the lexical specification of specific verbs to determine what constitutes the complement.

X-Bar Theory is an overgeneralization in that it suggests that all heads take complements. However, in the bi-polar theory only relational heads take complements. The lexical heads of object referring expressions do not take complements even when the lexical head is a relation (in which case it is construed objectively and its complements are suppressed).

The key advance made in X-Bar Theory is the distinction between specifiers and modifiers (or adjuncts). Chomsky (1970) realized that the specifier played a different syntactic role than adjuncts. The specifier combines with a non-maximal head to form a maximal projection whereas adjuncts combine with a non-maximal head without forming a maximal projection. Unfortunately, the syntactic basis of X-Bar Theory leaves this distinction unmotivated and the specifier has taken on a range of different (semantically unmotivated) syntactic functions in various versions of X-Bar Theory (e.g., the treatment of the subject as a specifier; the treatment of the specifier position as a landing site for movement). In the bi-polar theory a maximal projection corresponds to a referring expression and it is the specifier that typically determines a referring expression. Modifiers do not perform this referential function and they do not combine with heads to form maximal projections (unless the head is already a maximal projection).

In earlier linguistic treatments, specifiers and modifiers were typically lumped together as modifiers, adjuncts, or attributes (e.g., Hockett, 1958, Lyons, 1968, and McCawley in the quote above) and the term specifier does not occur. For example, Lyons (1968, p. 233), in discussing endocentric constructions, states that "the constituent whose distribution is the same as that of the resultant construction is called the *head*; the other constituent is called the *modifier*." Current versions of dependency grammar (e.g., Hudson 1984) and (combinatorial) categorial grammar (e.g., Steedman, 2000) continue to treat specifiers and modifiers alike as dependents of the head with which they combine, although Montague Grammar (Rick Cooper, personal communication) apparently treats the determiner as a head and not a modifier (pre-dating this use in current versions of X-Bar Theory).

In the original formulation of X-Bar Theory (Chomsky, 1970), although noun phrases and verb phrases adhered to the X-Bar schema, the sentence (or clause) level retained the familiar form

S → NP VP

Subsequently, the sentence level was also incorporated into the X-Bar schema by the introduction of functional heads (e.g. I for inflection with IP as the phrasal category and

C for complementizer with CP as the phrasal category) and the treatment of the subject as the specifier of IP. This brought the sentence level into alignment with the uni-polar X-Bar schema, but at the expense of dispensing with the basic subject-predicate structure of the clause.

Chomsky (1982) attempts an integration of form and function by suggesting that grammatical functions are represented configurationally in D-Structure. For example, the subject is represented configurationally as the noun phrase that is sister of the verb phrase in a sentence. As I have tried to show in this paper, multiple parts of speech and forms of expression can take on functional roles like subject and head and a purely configurational description of grammatical functions is inadequate in that it fails to capture the relevant generalization over the parts of speech and forms of expression that fill these functional roles.

As a simple example of where a configurational analysis breaks down, consider the use of a pronoun like “he” as a full nominal. In an expression like “he ate”, a configurational analysis that relies on “he” being a noun phrase (which is sister to a verb phrase and daughter of a sentence, for instance) must treat the pronoun “he” in “he ate” as simultaneously a noun and a noun phrase. But pronouns are not nouns and they do not have the same distribution as nouns. While they do have similar distribution to noun phrases (since pronouns and noun phrases may both function as object referring expressions), 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, which they do not.

As another example, on the assumption that the basic sentence structure of English is NP VP, expressions like “that he likes you” in “that he likes you is nice” and “bobbing for apples” in “bobbing for apples is fun” must be NPs. But this begs the question of what an NP is. What is the configurational basis for calling “that he likes you” or “bobbing for apples” an NP? Where are the noun heads of “he likes you” and “bobbing for apples”? Subjects in English can take on a wide range of expression forms. It is their function as subject that provides the appropriate generalization, not their configurational status as NPs, which they are not. ### Explain why adding functional heads doesn’t solve this problem!!!!

Langacker’s Conceptual Schema

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:

(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 prototypical grounding predication is a deictic word that refers to the speaker, the hearer or some other person in the immediate context (e.g., “I,” “you,” “he,” or “she”). The determiner in a

nominal expression and the first auxiliary (or modal) verb in a clause also function as grounding predications. In the case of a clause, the first auxiliary grounds the situation expressed by the clause into the context of utterance. 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. 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 expression 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 basic 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 constituent 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. That is, 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 special 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 constituents and the component 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. (This same argument was used against Abney's DP Hypothesis and his introduction of s-heads as complements of a DP head in the previous section.)

Langacker is not the only Cognitive 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. In the bi-polar theory, a referring expression typically consists of a specifier and a head which are functionally distinct from the part of speech of the words or expression forms of which they are constituted. Langacker (1991) 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) 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 (where a part of speech reflects the base construal of a lexical item) as opposed to a 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 bi-polar theory is to treat grounding predications, quantifying predications and type specifications as conceptual features that supplement the semantic content of heads, modifiers, specifiers and complements. These conceptual features are not the

grammatical diacritics that Langacker argues against in syntactic approaches to linguistic representation. Rather, they represent additional semantic information that is provided by the lexical item or expression functioning as a head, modifier, specifier or complement. 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

(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 4 below uses a tree diagram to represent this schema in more detail:

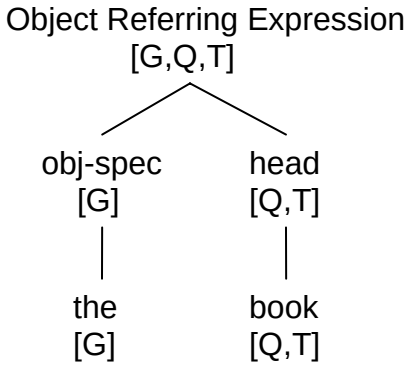

Figure 4: Adding abstract conceptual features

Note that [G] and [Q,T] identify the conceptual roles of the specifier and head, but do not provide any details about those conceptual roles. 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 detailed descriptions into the tree diagram we have Figure 5, where [def] indicates the definite grounding predication of “the”, [sing] indicates the singular quantifying predication of “book” and [book] indicates the type specification. This representation is very close to that put forward in the bi-polar theory when features are added.

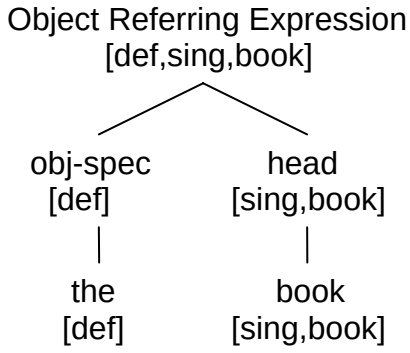

Figure 5: More specific conceptual features

In the bi-polar theory, features are a means of providing additional semantic detail at a particular level of abstraction—in particular, at the level of abstraction represented by the functional categories head, modifier, specifier, and complement (and their subtypes). 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 and indefinite object specifier. Alternatively, a feature notation may be used in which the more abstract specifier category is marked for the relevant semantic features as in

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

These are really just alternative representations of the same semantic content. Regardless of how the semantic content is represented, the word “the” provides information about the definiteness and “objectness” of the head it profiles and the word “to” (i.e., the infinitive marker) provides information about the non-finiteness and “predicateness” of the head it profiles.

The correlation between categories and features goes back at least to Chomsky (1970, p. 208) where he suggests the replacement of categories by sets of features, although he continues to use category labels for convenience. However, categories are more than just a convenience in the bi-polar theory. They are the basis for the creation of schemas at multiple levels of abstraction. Further, there is no assumption that the feature set of a category is necessarily fully determinate, nor that the inheritance of features in a hierarchy of categories is absolute and indefeasible, nor that all features are of equal importance to a category.

The integration of Langacker’s conceptual schema with the bi-polar theory would be facilitated by the addition of the specifier function to his description. The addition of the specifier function makes it possible to provide more constrained and semantically motivated definitions of the traditional head, modifier and complement functions than is otherwise possible. The specifier is the locus for the encoding of referential information. Modifiers (of heads) and heads are the locus for the encoding of information about the relational (and objective) type of expressions. Complements are the locus for encoding information about the participants in relations. In Langacker’s terms, the specifier supports the encoding of grounding and (optionally) quantifying predications. Heads and modifiers support the encoding of type specifications and, via number marking, quantifying and grounding predications. Quantifying predications are primarily referential and are typically expressed by quantifiers functioning as specifiers, but may also be expressed by quantifiers functioning as modifiers that constrain the relational type of the heads they modify. In addition to encoding referential information, specifiers profile the heads they specify. Modifiers constrain the referential and relational range of the profiled head. Complements encode referential and relational information about the participants in relations, but that information is not profiled in the larger relational expressions in which they participate.

In discussing the grounding predication of clauses, Langacker argues that only the first auxiliary or modal verb provides the grounding predication and that all other auxiliaries form part of the head. Further, the composition of these components proceeds from the main verb outwards. For example, in the expression “he could not have been

kissed", "kissed" first combines with "been" which combines with "have" which combines with "not" which combines with "could". A similar position was adopted in an earlier version of the bi-polar theory in which the first auxiliary or modal (also called the operator) filled the specifier role, with other auxiliaries functioning as modifiers of the main verb (note that Langacker treats the outer auxiliary as a head which combines with a verbal complement). However, there are reasons for modifying this position. Auxiliaries are members of a closed class verb subtype that look and behave very much like other specifiers (i.e., they are short, frequently occurring, and provide a referential function). Further, from a processing perspective, delaying the composition of complex auxiliaries until the main verb is processed, would strain the capacity of short-term working memory. In the processing of "he could not have been kissed", if auxiliaries do not compose together until the main verb is encountered, five separate linguistic chunks (e.g., "he", "could", "not", "have", and "been") would need to be retained in short-term working memory until the main verb "kissed" is processed. Allowing auxiliaries to compose together in forming a composite specifier "could not have been", avoids the need to retain separate chunks in short-term working memory.

Summary

It has been argued that the basic structure of nominals and clauses is bi-polar—consisting of a *referential* pole and a *relational* pole. The locus of the referential pole is the *specifier*. The locus of the relational pole is the *head*. *Modifiers* may be attracted to one pole or the other (as well as to other grammatical functions). If the head is a relation, one or more *complements* may be associated with the head.

The grammatical functions *specifier*, *head*, *modifier*, and *complement* are generally adequate to represent much of the basic structure and function of nominals and clauses—especially with respect to the encoding of referential and relational meaning. Lexical items of different parts of speech and various forms of expression may fulfill these grammatical functions making it important to distinguish the grammatical function of a lexical item and expression from its part of speech and expression form. Additional grammatical functions may be needed to represent other dimensions of meanings that get encoded in language and to handle noncanonical forms of expression.

The bi-polar theory adopts a strong form of Jackedoff's Grammatical Constraint in arguing that meaning is directly reflected in surface structure and not separately from it (i.e. via some mapping from syntactic structure to meaning structure). There is no level of linguistic semantic representation that is distinct from syntactic representation. Support for this position is provided by evidence that the appropriate level of grammatical generalization is over grammatical functions and not the multiple lexical items and expression forms that can fulfill these functions. From the perspective of generative grammar, the strong form of the grammatical constraint suggests a collapsing of surface structure (or S-Structure), deep structure (or D-Structure) and logical form (or LF). (Minimalism collapses D-Structure and LF into LF, but not S-Structure which becomes PF.) Further, appropriate description of the single level of linguistic representation is in terms of grammatical functions and not expression forms which are only configurationally related to grammatical functions under (at best) prototypical conditions. Linguistic representations are grounded in a situation model which is a mental representation of the evolving situation being described. Although linguistic

representations integrate form and function, they are not in and of themselves complete descriptions of meaning. They populate a half-way ground between linguistic form and full conceptual meaning, providing the cues needed to construct conceptual representations from the perspective of language and the linguistic conventionalization of meaning.

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