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

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Abstract

It is taken as axiomatic that 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. 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

It is taken as axiomatic that grammar encodes meaning. This position is consistent with basic principles of *Cognitive Linguistics* (Langacker, 1987, 1991; Lakoff, 1987; Talmy, 2000; Croft and Cruse, 2004). According to Langacker (1987, p. 12) "grammar is simply the structuring and symbolization of semantic content." This position is also related to Jackendoff's *Grammatical Constraint* (1983, pp. 13-14) "…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." In its strongest form—the form adopted in this paper, although not by Jackendoff—syntactic and semantic representations are not distinct and the grammatical constraint aligns closely with cognitive linguistics. Again, according to Langacker (1987, p. 12) "…it makes no more sense to posit separate grammatical and semantic components than it does to divide a dictionary into two components, one listing lexical forms and the other listing lexical meanings".

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). 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 inherent 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, a pre-head modifier in 9, and the head of a nominal in 10.

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 (e.g. Chinese) in which this division does not occur. 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 full referring expressions is also very common. Further, 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 purely 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 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 a 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 head. 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. 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.

The bi-polar theory of the grammatical encoding and integration of referential and relational meaning described in this paper is called **Double R Grammar**. Further details are available at www.DoubleRTheory.com.

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
  - The *in(side)* of the tunnel
- 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 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
  - I am *woman*
  - 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. 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 (see the discussion 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. 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

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.

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 additional 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.

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*
    - 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 attributed 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 Double R Grammar 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. From a processing perspective, the resulting representation depends on whether the specifier "is" combines with the relation "on" before the nominal "the table" combines with "on". 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 30, the prepositional phrase "on the table" is conjoined with the verb phrase "scratching it". This example may be viewed as providing support for the existence of verb phrase constituents. However, verb phrases are neither complete referential nor complete relational units. From a relational perspective, verb phrases are missing the subject complement, and from a referential perspective, verb phrases lack the tense specification which identifies the described situation in time, thereby supporting reference. In the expression

31 He is *eating a sandwich*

many linguistic formalisms treat "eating a sandwich" as a verb phrase constituent. However, from a processing perspective, it seems reasonable to integrate the specifier "is" with the verb "eating" and the subject "he" with the predicate referring expression "is eating" before processing the remainder of the clause. Waiting until the end of the clause to integrate "is" with "eating a sandwich" and "he" with "is eating a sandwich" requires maintaining these constituents separately in memory for an arbitrary amount of time until the rest of the clause can be processed. The limited capacity of *short-term working memory* (Ericsson and Kintsch, 1995) is unlikely to be able to support such an approach to language processing. Examples like

32. The man hit and the woman kicked… the ball

provide further evidence against the necessary division of a sentence into a subject (or noun phrase) and verb phrase. "And" conjoins the two incomplete clauses "the man hit…" and "the woman kicked…", with the object of the two clauses being instantiated by the single nominal "the ball" which occurs after the conjuncts. Further, the attachment of the verb to the subject in examples like

33. He's a man

and the morphological marking of the subject on the clausal head and the lack of (or optionality of) an overt subject in many languages (e.g. Spanish) argue against separating the subject from the clausal head. Insisting on the treatment of "is a man" as a verb phrase in example 33 is considered a violation of the strong from of the grammatical constraint (although Jackendoff does just this in his syntactic representation of "the little star's beside a big star" example—Jackendoff, 2002). From a grammatical perspective,

"he's" forms a grammatical unit (independently of "a man"), whether or not one's linguistic theory is consistent with that being the case.

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. The more specific term *object specifier* is used to refer to nominal specifiers. Reference in Double R Grammar 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. Note the implication that the predicate specifier combines with the relational head before the relational head combines with its complements. The predicate specifier combines with the relational head to form a *predicate referring expression* which refers to a relation. This predicate 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

34. I think (that) he likes you

35. *He likes you is nice
36. 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 predicate 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:

37. 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

38. Going to the movies is fun
39. 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

40. He kicked the ball
41. *He going to the movies
42. *He to go to the movies
43. He is going to the movies
44. 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 Double R Grammar 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—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.

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:

45. The book is good
46. *Book is good
47. John’s book is good
48. *John’s the book is good

46 is ungrammatical because the specification of the nominal “book” is missing. 48 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:

49. *running
50. *is running
51. The man is running
52. Running is fun
53. *Is running is fun
54. *The man is running is fun(ny)
55. 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

56. 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

57. 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. The four basic categories: head, modifier, specifier, and complement do not support a distinction between modifiers of heads and modifiers of modifiers and the term *relational modifier* is introduced to support this distinction. Relational modification is the typical function of adverbs.

Besides modifying heads and other modifiers, modifiers may also modify specifiers and full referring expressions. Examples of each type of modification are shown below. 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 relational modifier "voraciously" modifies the predicate referring expression "is eating". From a processing perspective, it does not seem reasonable to delay the integration of "is" with "eating" until after "voraciously" can be combined with "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 (as it is in generative grammar). Insisting that tense be separately represented from the main verb is considered a violation of the strong form of the grammatical constraint. In "he is going out", "out" may either modify just the head "going" or the specified head "is going" depending on whether a subtype of the **|specifier head|** schema (e.g. **|is going|**) or the **|verb particle|** schema (e.g. **|go out|**) is applied first during processing. Which schema gets applied first may depend on prosodic features of the use of the expression as in "He…is going…OUT" vs. "He's…GOING OUT". In "unfortunately, he left", "unfortunately" modifies the entire situation referring expression "he left" and not just the head "left". Based on the above examples, there are three possibilities for clausal modification: 1) modification of the unspecified head of the clause, 2) modification of the specified head (predicate referring expression), and 3) modification of the entire clause (situation referring expression). Thomason and Stalnaker (1973) present an approach to adverbial modification in which an adverb may either modify a verb phrase—what they call *predicate modification* which includes the verb and non-subject complements—or an entire sentence—what they call *sentential modification*. It was argued above, that verb phrases are incomplete referential and

relational units. As such, they are unlikely to function as a locus of relational or referential modification.

The effects of the locus of modification on meaning in the above examples are quite subtle. It makes little difference in meaning if "voraciously" is modifying "eating" or "is eating". In sentences containing multiple clauses or multiple relational units, the effects are more pronounced. Consider

58. He stopped walking slowly (see also Chafe, 1970)

in which "slowly" may modify "walking" or "stopped walking". If "slowly" modifies "walking" then the meaning of the sentence is consistent with a situation in which the person may still be walking, albeit not slowly, whereas, if "slowly" modifies "stopped walking" then the person has ceased walking and is no longer walking, although the act of ceasing to walk occurred slowly. 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 Double R Grammar, 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. Double R Grammar acknowledges the existence of both head-modifier and relation-argument relationships and suggests 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

59. 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 predicate 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”).

A processing argument can also be made for the combination of the negative and additional auxiliary verbs with the first auxiliary verb (sometimes called the *operator*). If the auxiliary verbs and negatives combine with the main verb, than the auxiliary verbs and negative will need to be retained in memory as separate linguistic units until the main verb occurs. On the assumption that short-term working memory only has the capacity to retain a few distinct linguistic units, this is likely to lead to an overloading of the capacity of short-term working memory which should result in processing difficulty. Such processing difficulty is unattested in adult native speakers of English.

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

60. books
61. two books
62. first two books
63. 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 62 is explained since there is no specifier for “first” to modify. In example 63, “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 (object referring expression or 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. Such conventionalization may be driven 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

64. I_1 bet you_2 $\underline{five\ dollars}_3$ $\underline{I\ win}_4$ (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

65. 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 65, 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 predicate referring expression and a predicate 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 predicate 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. 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 predicate “give…to” similar to the way verb particles contribute to predicates, 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

66. He painted the building blue

If the **|subj *paint* obj|** schema is retrieved when "painted" is processed and the **|pred 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$_{subj}$ painted$_{pred}$ the building$_{obj}$ | blue$_{mod}$|

with "blue" functioning as an atypical predicate 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|

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

||he$_{subj}$ painted$_{pred}$ the building$_{obj}$ blue$_{color}$|

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 a causative schema (or construction) **|subj pred obj direction|** activated by the processing of "the napkin" in the context of "he sneezed" and leading to **|he$_{subj}$ sneezed$_{pred}$ the napkin $_{obj}$ off the table $_{direction}$|**.

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). 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 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). However, from a relational perspective, subjects and other complements are all arguments of the predicate with equal relational status, and they are treated as such in Double R Grammar. To the extent that the notion of an external subject is legitimate, it is presumably tied to dimensions of meaning like topicalization and saliency, or to processing considerations (e.g. retaining the subject as a separate unit in short-term working memory) which are not currently addressed in Double R Grammar.

X-Bar Theory

The meaning based definitions of specifier, head, modifier and complement used in Double R Grammar 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°), (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 syntactic type (e.g., N, V, A, P) for which the variable X is a generalization. At each level in the representation, X corresponds to the same syntactic type and the head is said to project that type 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:

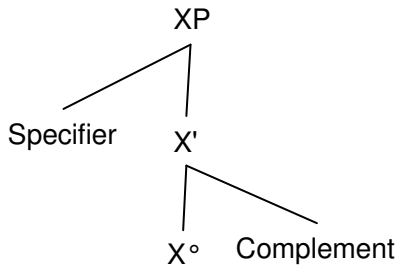

Figure 1 A common, simplified variant of X-Bar Theory

Double R Grammar accepts that X-Bar Theory captures an important grammatical generalization, but provides a semantic basis for that generalization (Ball, 2003). 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 relational 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 relational type of the DP. However, the idea that a complement can project the relational type of an expression, 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 Double R Grammar—although his treatment of the noun head of the object of a preposition as the s-head of the prepositional phrase contrasts with the Double R Grammar 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 relational 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 Double R Grammar, 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 1, a single complement combines with the head and it is unclear how multiple 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 and prepositions being prototypical. But X-Bar Theory provides no mechanism for representing the relationship of the subject or first argument to the relational element and the specifier position has been co-opted in several variants of X-Bar Theory for this purpose. In fact, Cann (1999) suggests that Chomsky's main motivation for introducing the specifier was to provide an account for the subject. In Double R Grammar, the subject is a complement of the relational head of a clause, not a specifier. The subject says nothing about the referential status of the clause. That the subject happens to be in the typical position of a specifier in English is only true if the real predicate specifier (i.e., the auxiliary verb or tense marker on the main verb) is treated as a head and not a specifier. Further, treating the subject as a specifier still leaves open the question of how to handle multiple object complements. For example, in the expression "I bet you $50 we win" there are three complements "you," "$50," and "we win" following the verb "bet" in addition to the subject complement. X-Bar Theory provides no mechanism for representing more than one object complement which does not violate some basic assumption of the theory (e.g., allowing additional complements to combine with non-minimal heads). Jackendoff (1977) gets around this problem by treating the term *specifier* as referring to everything to the left of the head and the term *complement* as referring to everything to the right of the head and according these terms no theoretical significance. And Chomsky in his original formulation of X-Bar Theory (1970) allows the term *complement* to refer to multiple complements. Unlike Jackendoff, Double R Grammar accords these terms theoretical significance, and despite Jackendoff's claim that Chomsky did not accord them theoretical significance, Chomsky's choice of the terms *specifier* and *complement* suggests otherwise as does Chomsky's suggestion that determiners (in NPs), auxiliaries (in VPs) and degree adverbials (in APs) function as specifiers (i.e., they specify NPs, VPs and APs, respectively). Not only does Double R Grammar accord these terms theoretical significance, Double R Grammar provides a semantic motivation for their existence.

Finally, X-Bar Theory is an overgeneralization in that it suggests that all heads take complements. However, in Double R Grammar 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).

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 purely 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 Double R Grammar 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).

Some variants of X-Bar Theory (and categorial grammar) adopt a strong version of the *binary branching hypothesis* which allows a non-terminal to expand into at most (and at least) two linguistic elements. The binary branching hypothesis is supported on primarily formal grounds which have no semantic basis and its acceptance clouds the representation of the relationship between a relational element and its arguments when there is more than one argument. Double R Grammar allows more than one complement to be represented on a single level of representation, especially at the clausal level, and more directly represents this relationship.

The binary branching hypothesis is an example of a formal approach to syntactic analysis which is too rigid to be supportable. There are too many dimensions of meaning that need to be encoded for such a rigid hypothesis to be sustainable. The same holds true for X-Bar Theory more generally. The specifier in X-Bar Theory is the locus for the encoding of referential meaning. However, referential meaning may also be encoded via morphological marking (e.g., singular vs. plural number marking), or may be an inherent part of a lexical item (e.g., deictic words, proper nouns, and pronouns). As such a

separate specifier need not always mark maximal projections (i.e., referring expressions), and the specification function may well be spread across multiple lexical items—both of which violate the basic X-Bar Schema. Viewed as a representation of the prototypical structure of a nominal (ignoring complements) or clause (ignoring the lack of a subject complement), the schema is entirely appropriate. Put forward as an inviolable element of universal grammar, it is fraught with contradictions and inconsistencies typical of the kinds of grammatical analyses it was intended to replace. As a final example, consider that the proliferation of functional heads, combined with the binary branching hypothesis, leads to a proliferation in the number of levels in X-Bar Theory based representations. But there is nothing in the X-Bar Schema that predicts the order of composition of these levels. That is, the head does not subcategorize for its complements. While it is implicitly assumed that V combines with NP (obj) to form VP, and I (or T) combines with VP to form IP (or TP), and C combines with IP to form CP, nothing in the X-Bar Schema requires this, and T could just as well combine with PP or AP to form TP, or V could combine with TP or CP to form VP. Adding in additional phrasal level categories (e.g., NegP, AgrS, AgrO) only exacerbates this problem. Of course, it is typically assumed that lexical items provide the subcategorization of complements needed to avoid this overgeneration of possible structures, but given such subcategorization frames for complements and adding similar frames to handle the function of specifiers, X-Bar Theory becomes largely redundant and the subcategorization schemas of individual lexical items become nearly all that is necessary (which may help explain the elimination of X-Bar Theory in the Minimalist Program). Nonetheless, X-Bar theory still represents a useful generalization over those schemas, though it needs to be made consistent with the schemas it generalizes and it is unlikely to be universally applicable in any strong sense.

Langacker's Conceptual Schema for Nominals and Clauses

Langacker (1991) provides a detailed Cognitive Linguistic description of the conceptual content of nominals and clauses which is closely aligned with the basic composition of referring expressions as described in Double R Grammar. 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. Note that 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 Double R Grammar 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.)

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 Double R Grammar. Less clear is the correspondence between Langacker's quantifying and instantiating predications and the functional categories of Double R Grammar. 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 inherent meaning 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. Double R Grammar 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 Double R Grammar 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 2 below uses a tree diagram to represent this schema in more detail:

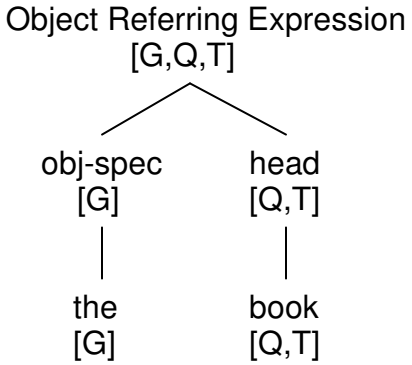

Figure 2 Adding abstract conceptual features

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 3, 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 Double R Grammar when features are added.

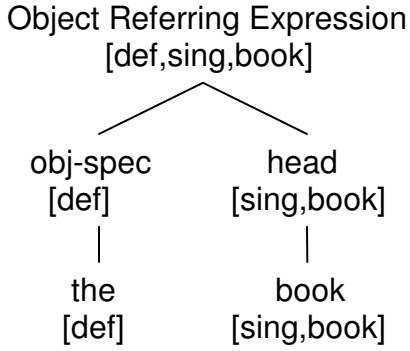

Figure 3 More specific conceptual features

In Double R Grammar, 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. That is, 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 Double R Grammar. 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 Double R Grammar 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 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 Double R Grammar 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. 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 inherent 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.

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