The symbolic alternative

Ronald W. Langacker, University of California, San Diego

The **autonomy thesis**, and more specifically the relationship between grammar and meaning, is not unreasonably regarded as the most fundamental and critical issue in modern linguistic theory. Yet consideration of the thesis has often been less than a model of conceptua, what it entails and what would demonstrate its validity. It is widely believed that the autonomy thesis is well established. I suggest, however, that the apparent basis for such a view involves equivocation concerning the nature of autonomy, erroneous assumptions about linguistic semantics, and failure to examine all possible alternatives[1].

I will understand the autonomy thesis as claiming that grammar constitutes a separate level or domain of linguistic structure – one with its own primitives, representations, etc. – *that is properly described without essential reference to meaning*. Now it is commonly assumed (explicitly in Newmeyer 1983) that such autonomy is established if any aspect of grammatical structure is less than fully predictable on the basis of meaning or other independent factors, i.e. if any facet of grammar has to be learned or stated explicitly instead of simply "falling out" as an automatic consequence of other phenomena. And of course, any clear-headed person must recognize that absolute predictability of this sort cannot be achieved: grammatical patterns and restrictions do have to be specifically learned and explicitly described. In that sense, grammar *is* autonomous.

Crucially, however, this does not entail the autonomy thesis as just defined. To proceed from non-predictability to the further conclusion that grammar represents a separate, asemantic domain of linguistic structure is to embrace the **type/ predictability fallacy** – it confuses two quite distinct issues, namely what *kinds* of structures there are, and the *predictability* of their behavior. Unconfusing these issues allows one to formulate a position describable as the **symbolic alternative**: that grammatical structures, patterns, and restrictions are indeed less than fully predictable,

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1 An earlier version of this paper appeared as 'Cognitive Grammar: The Symbolic Alternative' in *Studies in the Linguistic Sciences* 20.2, 1990, 3-30.

but that their description requires nothing more than **symbolic** elements (i.e. pairings between semantic and phonological structures).

If grammar reduces to symbolic relationships, then all grammatical elements must have some kind of meaning or conceptual import. Standard lines of argument invoked to sustain the contrary position (and hence the autonomy thesis) tacitly presuppose what I consider to be an inappropriate view of linguistic semantics, namely an **objectivist** view based on truth conditions and classical categories (cf. Lakoff 1987). One type of argument consists of showing that the "same" meaning can be coded by expressions representing different grammatical classes (Newmeyer 1983: 9). For instance, the fact that either a verb or a noun – e.g. *explode* and *explosion* – can refer to the same event might be taken as indicating that they have the same meaning and consequently that the noun and verb classes cannot be semantically definable. Suppose, however, that one adopts a **subjectivist** or **conceptualist** view of meaning. One can then argue (and intuitively I find it quite obvious) that *explode* and *explosion* have *different* meanings; more specifically, the nominalization of *explode* to form *explosion* involves a kind of conceptual reification. If so, semantic characterizations of the noun and verb classes remain possible, at least in principle (see Langacker 1987b).

Also erroneous is the assumption that a grammatical morpheme must be meaningless unless one can formulate a single meaning that accounts for all its uses. We know, however, that lexical items are almost invariably polysemous, having not just one meaning but a family of related senses. Why should the same not be true of grammatical elements? In its different uses, for example, dative case in German has such meanings as 'experiencer', 'recipient', and 'neighborhood' (Smith 1987). There are plausible connections among these senses, and failure to reduce the German dative to a single Gesamtbedeutung would not entail that it is meaningless.

Language has the basic semiological function of permitting the symbolization of conceptualizations by means of phonological sequences. If one accepts this characterization, then a theory which embraces the symbolic alternative and achieves the reduction of grammar itself to symbolic relationships ought to be preferred on grounds of naturalness, conceptual unification, and theoretical austerity. If workable, a symbolic account of grammar ought to be greeted enthusiastically by linguistic theorists and abandoned only with the greatest reluctance. My objective here is to sketch such a theory and argue that it is indeed workable. Called **cognitive grammar**, this framework has been under development since 1976 and by now has been successfully applied to diverse languages and a broad array of grammatical phenomena[2].

Although the term "natural" is subject to varied interpretations, I think it is not unreasonably applied to a theory of language that is solely and squarely based on the semiological function of language as a way of expressing meaning. Another respect in which cognitive grammar might well be considered natural is that only well-established

2 See, for example, Langacker 1987a, 1990, 1991; Casad 1982; Cook 1988; Farrell 1990; Hawkins 1984; Janda 1984, 1993; Lindner 1981, 1982; Maldonado 1988, 1992; Poteet 1987; Rice 1987a, 1987b; Rudzka-Ostyn 1988; Smith 1987; Tuggy 1981, 1986; Vandeloise 1984, 1986, 1991; van Hoek 1992.

or easily demonstrable cognitive abilities are invoked. Such abilities include the following:

(1)(a) to form structured conceptualizations

(b) to perceive and articulate phonological sequences

(c) to establish symbolic associations between conceptual and phonological structures

(d) to use one structure as a basis for categorizing another

(e) to conceive a situation at varying levels of abstraction (schematization)

(f) to detect similarities between two structures

(g) to establish correspondences between facets of different structures

(h) to combine simpler structures into more complex ones

(i) to impose figure/ground organization on a scene

(j) to construe a conceived situation in alternate ways.

In view of its semiological function, moreover, linguistic structure could hardly be conceived in a simpler, more straightforward manner than it is in cognitive grammar. A basic claim of the theory is that language comprises *semantic structures*, *phonological structures*, and *symbolic links* between them – nothing more. A symbolic structure is said to be **bipolar**: a semantic structure functions as its **semantic pole**, and a phonological structure as its **phonological pole**, as shown in Fig. 1(a). Semantic, phonological, and symbolic structures of any degree of complexity are capable of being formed and coalescing as established **units** (i.e. well-rehearsed cognitive routines), as sketched in Fig. 1(b). This much clearly *has to* be imputed to language. The central thesis of cognitive grammar is that *only this* need be imputed to it. In particular, lexicon, morphology, and syntax are seen as forming a gradation and as being fully describable by means of symbolic units alone. In this way the theory achieves conceptual unification.

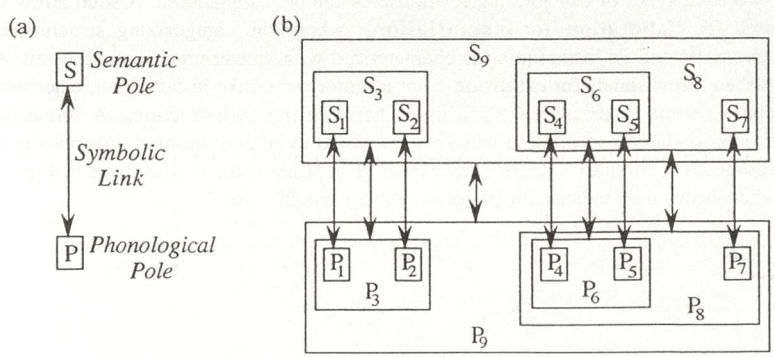
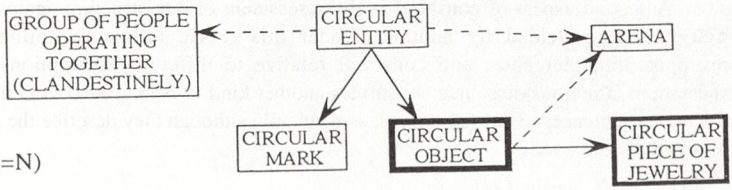


Figure 1

Cognitive grammar achieves theoretical austerity by imposing stringent limits on the kinds of units one can postulate. The **content requirement** specifies that the only units ascribable to a linguistic system are (i) semantic, phonological, and symbolic structures that are part of overtly occurring expressions; (ii) **schematizations** of permitted structures; and (iii) **categorizing relationships** between permitted structures. Consider a phonological example. The syllables [tap], [bɛd], and [ræn] are parts of overtly occurring expressions. The syllable canon [CVC] represents a schematization over such structures. And the following formula, with a solid arrow, indicates the categorization of [tap] as an instance of the [CVC] category: [[CVC]→[tap]]. The content requirement rules out all descriptive constructs that are *arbitrary* in the sense of not being directly discernible in the primary data of actual expressions, or else derivable by means of the basic cognitive abilities of abstraction and categorization. Precluded, for example, is the use of empty diacritics, or of any other construct attributed neither phonological nor semantic content (e.g. phonologically null syntactic "dummies"). Also prevented is the artifice of generating every possible string of elements and then imposing the needed restrictions by means of a set of "filters" that specify what *cannot* occur. I am not aware of any other framework imposing such a powerful constraint.

But is such a model actually workable? Can a description employing only symbolic units indeed accommodate the full range of grammatical phenomena, including those generally taken as supporting the autonomy thesis? I believe so, and in what follows I will try to indicate how (at least in general terms). To do this, I must start by sketching an appropriate view of linguistic semantics.

I take a subjectivist approach to semantics in which meaning is equated with *conceptualization* in the broadest sense of that term (any kind of mental experience). Moreover, a particular symbolic unit – such as a lexical item or a grammatical morpheme – typically has more than one meaning, i.e. its meaning represents a **complex category**. Most linguistic categories are complex in the sense that they do not reduce to any single structure. Such a category must instead by described by a *network* whose nodes are structural *variants* and whose links are *categorizing relations*. Two basic types of categorizing relationships can be distinguished. A solid arrow is used for **elaboration** (or **instantiation**), where the categorizing structure is **schematic** and its instantiation is characterized with greater precision and detail. A dashed arrow stands for **extension** from a prototype; unlike instantiation, extension implies some conflict in specifications between the two structures. A linguistic expression having multiple, related senses is said to be **polysemous**: semantically it comprises a complex category representable as a network, as illustrated in Fig. 2, where heavy lines indicate the prototypicality of certain senses.



ring (=N)

Figure 2

Cognitive semantics is **encyclopedic**, in that it denies the existence of any sharp, motivated boundary between *semantics* and *pragmatics*, or "linguistic" and "extra-linguistic" knowledge (Haiman 1980). Instead, an expression is thought of as flexibly invoking a large array of potentially open-ended knowledge systems, which provide the basis for its semantic characterization. I refer to these as **cognitive domains**. For example, the conception of the overall configuration of an arm is one cognitive domain invoked for the characterization of *elbow*. Similarly, the meaning of *onside kick* presupposes substantial knowledge of the rules, strategies, and objectives of football. Given the appropriate knowledge base, describing the meaning of such expressions is fairly straightforward; without it, the task is hopeless. Observe that a cognitive domain represents an *integrated conception or conceptual complex* – it is not equivalent to a bundle of semantic features or criterial attributes. According to this view, linguistic semantics cannot be divorced from the study of conceptual structure and cognitive development.

It is essential to realize, however, that an expression's meaning is more than just an array of conceptual content. Linguistic meaning depends not only on the content evoked, but also on how that content is **construed**. Commonly, in fact, expressions that invoke roughly the same body of conceptual content are nevertheless semantically distinct because they construe it in different manners. There are many aspects or dimensions of construal, only a few of which are singled out here for brief illustration.

First, a conceived entity or situation can be characterized at different levels of specificity and detail. Listed in (2) are three sets of expressions related in this fashion. Within a given set, each expression is *schematic* with respect to the one that follows (as indicated by the solid arrows).

(2)(a) *thing* → *animal* → *mammal* → *dog* → *beagle*

(b) *do* → *act* → *propel* → *throw* → *hurl*

(c) *Something happened.* → *Someone did something.* → *An adult propelled a physical object.* → *A woman threw a rock at a mammal.* → *A muscular woman hurled a large, jagged rock at a vicious beagle that had been growling at her.*

Observe that such relationships hold not only between lexical items, but also between novel expressions of any size, as in (c). Indeed, there is no fundamental distinction in this framework between "lexical" and "sentential" semantics. The same constructs are used for the description of semantic structures at any level of organization.

A second aspect of construal is the assessment of one structure against the **background** provided by another. Under this rubric fall such notions as presupposition, metaphor, and construal relative to different assumptions and expectations. Previous discourse constitutes another kind of background; it is in this respect that sentences (3)(a)-(c) contrast semantically although they describe the same event in the same words.

(3)(a) *JACK insulted Jill.*

(b) *Jack INSULTED Jill.*

(c) *Jack insulted JILL.*

(4) *They {even/only} have three cars.*

Note that certain expressions, such as *even* and *only* in (4), have no other function than to indicate where something falls in regard to expectations.

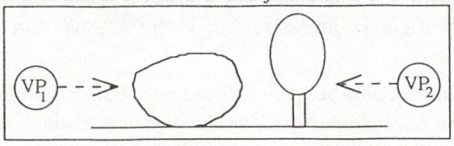
A third aspect of construal is what I refer to as **scope**. An expression's scope is the extent of its coverage in relevant cognitive domains, i.e. how much of those domains it specifically evokes and relies on for its characterization. For example, the conception of an arm provides the **immediate** scope for the characterization of *hand*, while the conception of a hand is the immediate scope for *finger*, and that of a finger for *knuckle*. Though usually implicit and only vaguely delimited, scope has important structural consequences – note, for instance, that we say *fingernail* rather than **handnail* or **armnail*. The same expression can often be construed with different scopes. Thus (5)(a) invokes the minimal scope for *jump* (it need only include the conception of someone leaving the ground), whereas the scope of *jump* in (5)(b) subsumes an entire scenario of preparation, running, leaving the ground, sailing through the air, landing, and measurement.

(5)(a) *She jumped to a height of seventeen inches.*

(b) *Carl Lewis is jumping now.*

The fourth dimension of construal, **perspective**, includes such factors as **vantage point**, **orientation**, and **directionality**. The first two terms are self-explanatory and can be illustrated by the expression *in back of*. In some uses, this expression invokes an implicit vantage point. Thus, in Fig. 3, *The tree is in back of the rock* is appropriate with respect to vantage point 1, but not with respect to vantage point 2. In other uses, *in back of* relies on the orientation of its object. It is Jill's orientation in Fig. 3(b) – the fact that she is facing away from Jack – that makes the sentence *Jack is in back of Jill* felicitous.

(a) *The tree is in back of the rock.*



(b) *Jack is in back of Jill.*

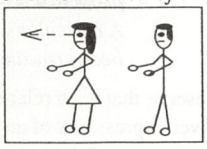


Figure 3

The term directionality is also self-explanatory in examples like (6), which describe the physical motion of an explicitly mentioned participant.

(6)(a) *The balloon rose swiftly from the valley floor.*

(b) *The rocket fell to the ground.*

(7)(a) *The hill gently rises from the bank of the river.*

(b) *The hill gently falls to the bank of the river.*

(8)(a) *This nerve branches just below the elbow.*

(b) *These nerves merge just below the elbow.*

However, consider examples (7) and (8). In each case we find a pair of sentences that describe the same situation yet differ in meaning. Intuitively, moreover, the semantic contrast is in each case ascribable to a difference in directionality. But nothing moves, at least objectively – all four sentences describe single, static configurations. The directionality responsible for the meaning contrasts must therefore be subjective, i.e. a matter of construal. What we want to say (based on intuition) is that the speaker or conceptualizer (as opposed to the subject) *scans mentally* through the scene in one direction or the other. In (8), for example, (a) is appropriate when one is mentally tracing a nerve's outward path from the central nervous system, whereas (b) would be used when tracing its inward path from the periphery. I take this *subjective directionality*, residing in the direction of mental scanning by the conceptualizer, to be an inherent aspect of the linguistic semantic value of such expressions.

The last dimension of construal is the relative **prominence** accorded to the various facets of a conceptualization. By itself, of course, the term prominence is vague and uninformative. There are numerous ways in which a conceived entity can be considered prominent, so a substantive analysis has to sort these out and properly distinguish them. We will concentrate here on just two kinds of prominence, both essential to grammatical structure. These are *designation* and *figure/ground organization*.

As one aspect of its meaning, every linguistic expression is construed as *designating* some entity within its scope. I will say that it imposes a particular **profile** on the **base** its scope provides. Intuitively, the entity accorded this special kind of prominence is something like a *focus of attention*. An expression's profile can also be thought of as its *referent* – not its referent in the "world" (if indeed it has one), but rather its referent *within the conceptualization that functions as its base*. For example, consider the nouns *hub*, *spoke*, and *rim*. In the pertinent sense, each invokes as its base the conception of a wheel; its role within the overall configuration of a wheel is crucial to its semantic characterization. These nouns differ semantically because they profile different substructures within this common base, as sketched in Fig. 4 (observe that profiling is indicated by heavy lines). We see from this simple example that two or more expressions may invoke essentially the same conceptual content yet have distinct meanings by virtue of their contrasting profiles.

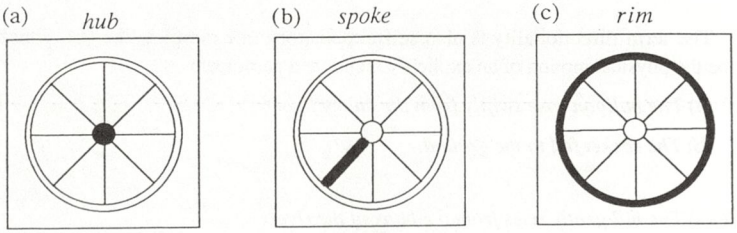


Figure 4

I use the term **predication** for the meaning of any expression, irrespective of its size or type. There are two basic kinds of predications: those which profile **things**, and those which profile **relations**. The terms thing and relation are used in a technical sense and defined quite abstractly (Langacker 1987b). By *thing* I do not mean just a physical object, but rather anything that can be characterized as a *region in some domain*. When used as a noun, for instance, *yellow* profiles (i.e. *designates*) a region in color space; a notation for this is given in Fig. 5(a). Similarly, *January* profiles a region within the conception of the calendrical cycle; *paragraph* designates a region within a written work; and *intermission* profiles a region within some kind of performance – a region characterized by the absence of the specified activity.

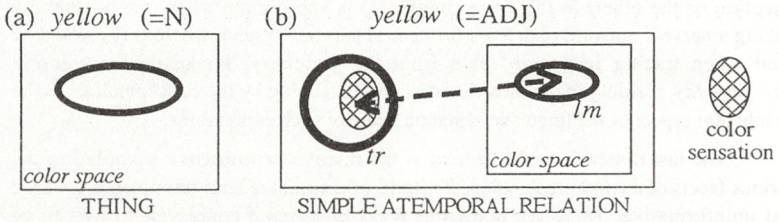


Figure 5

The term *relation* is also used in a very general sense. We can think of a conceived relationship as residing in cognitive operations assessing the location, relative position, or interaction of entities within a domain. Like things, relations can stand in profile, i.e. they can be *designated* by linguistic expressions. When used as an adjective, for example, *yellow* profiles the relationship sketched in Fig. 5(b). Participating in this relationship are two things: one is the same region in color space profiled by the noun *yellow*; and the other is an object that is the locus of a color sensation (usually on its outer surface). The dashed arrow stands for the profiled relation, namely the specification that the sensation in question falls within the yellow region of color space. Crucially, the entities participating in a relationship need not be distinct, salient, or mentioned individually. The adjective *yellow* can therefore be relational even though it takes only one overt argument, corresponding to the locus of the sensation (as in *yellow shirt*); since the other relational participant (a region in color space) is uniquely identifiable from the adjective itself, there is no need to spell it out with a separate nominal argument. Likewise, the adjective *square* is considered relational even though it too takes just one overt argument (e.g. *square table*). The

profiled relationship (equality of the sides, etc.) holds among subparts of the single participant, not between distinct participants.

Like **nominal predications** (which profile things), **relational predications** sometimes invoke the same conceptual content yet differ in meaning by virtue of their profiles. In their prototypical senses, for example, both *give* and *receive* evoke as their base the conception ot a canonical act of transfer. They contrast semantically because they profile different facets of this complex interaction, as shown in Fig. 6: *give* focuses on the agent's interaction with the mover, and *receive* on the recipient's.

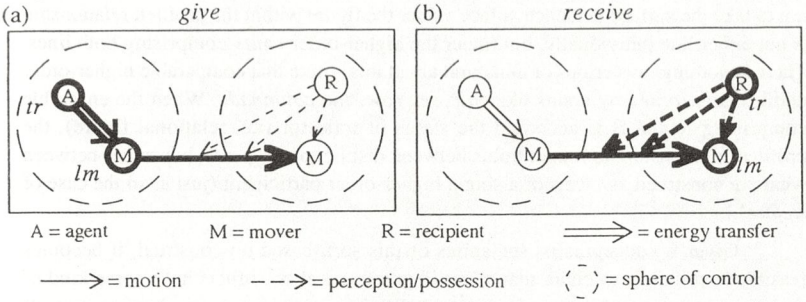


Figure 6

Yet profiling is insufficient by itself to distinguish many sets of relational predications that evoke the same conceptual content. Crucial in this regard is a final aspect of construal, namely the relative prominence accorded the various relational participants. I interpret this as being a matter of *figure/ground organization*. The term **trajector** (*tr*) is used for the participant serving as the *figure* in a profiled relationship; a salient entity other than the trajector is referred to as a **landmark** (*lm*). Consider the expressions *in front of* vs. *in back of*. They are clearly not synonymous, but precisely how to characterize their semantic difference is less than obvious[3]. As sketched in Fig. 7, the two expressions pertain to the same configuration, each profiling the relationship wherein one participant is roughly in the line of sight leading from a vantage point to the other participant. The difference, I suggest, is that *in front of* takes the far participant as a *landmark* for locating the near one, whereas *in back of* takes the near participant as the landmark. The other participant – the one being located – is the *trajector*, which I characterize as the *figure* within the scene.

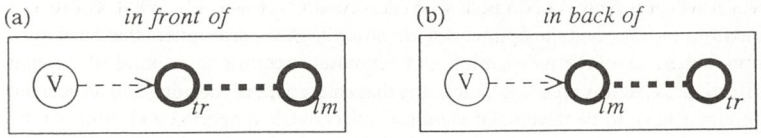


Figure 7

3 The traditional practice of referring to them as **converses** or **relational opposites** merely *labels* the difference without providing a characterization.

A comparable analysis is offered for the examples in (9), which I regard as non-synonymous despite their truth-conditional equivalence.

(9)(a) *Line A is parallel to line B.*

(b) *Line B is parallel to line A.*

(c) *Lines A and B are parallel.*

When I say that *A is parallel to B*, I am concerned with locating A and use B as a landmark for this purpose. Conversely, *B is parallel to A* makes B the figure within the scene and locates it with reference to A. What about the third example? I see no reason not to take the surface evidence at face value: the figure within the profiled relationship is not either line individually, but rather the higher-order entity comprising both lines. There is nothing mysterious or unnatural about this – note that comparable higher-order entities are *profiled* by nouns like *pair*, *set*, *row*, and *colonnade*. When the ensemble comprising A and B is accorded the status of trajector (i.e. relational figure), the profiled relationship no longer holds between distinct participants, but rather between what are construed as facets of a single higher-order participant (just as in the case of *square*).

Given a conceptualist semantics of this sort, based on construal, it becomes feasible in principle to claim that all valid grammatical constructs have some kind of meaning or conceptual import. In the symbolic alternative, grammatical structure itself is inherently meaningful, consisting solely in patterns for the structuring and symbolization of conceptual content. By choosing one grammatical construction or grammatical marker rather than another, one is inherently choosing to construe and portray a situation in a particular way – the difference in form symbolizes a meaning difference. Construal is especially important for understanding grammatical structure: though lexicon and grammar form a gradation, it is not a gross distortion to say that the primary function of lexicon is to provide conceptual content, and that grammar imposes a particular construal on such content.

Importantly, it is *not* claimed that grammar is *predictable* from meaning (and certainly not from meaning of the sort contemplated in objectivist or truth-conditional semantics). The claim is rather that a grammatical element is inherently symbolic, or bipolar: its semantic pole embodies a particular way of construing conceptual content, while its phonological pole provides a way of symbolizing that construal. Moreover, we cannot determine construal simply by consulting intuitions – indeed, we tend to be oblivious to construal (certainly most traditional semantic theory has been), perhaps because we are more concerned with the content conveyed. What construals expressions impose, and the optimal way to describe them, are matters that have to be determined by careful investigation and ultimately require some kind of explicit justification. What this means in practice is that an account of meaning and an account of grammar have to be developed *simultaneously*, each supported and informed by how it articulates with the other. It is the insight and coherence of the *overall* account that demonstrates the viability of the general approach.

What kinds of justification can in principle be offered for semantic descriptions of the sort proposed? One kind is intuitive naturalness, for whatever that may be worth.

A more substantive point is that the analyses rely only on well-established cognitive phenomena (such as figure/ground organization, the ability to focus attention on some limited aspect of a scene, our capacity to conceive a situation at different levels of specificity, and so on). Furthermore, a particular, restricted set of descriptive constructs are employed that prove systematically applicable to an extremely broad array of diverse data. For instance, the notion of profiling is applicable to all expressions at every level of organization (not just lexical items), and trajector/landmark organization holds for all relational predications.

Another potential source of justification are predictions about distribution and well-formedness that follow from the different construals imputed to otherwise similar expressions. Consider the contrast in (10)(a) between *few* and *a few*.

(10)(a) *He has {few/a few} close friends.*

(b) *{Few/*A few} linguists have any common sense.*

In terms of absolute quantity, the expressions may be the same – with either one there might be just three close friends, for instance. I would argue, however, that *few* is negative in the sense that it construes the quantity as a downward departure from some norm or expectation, whereas *a few* is positive because it views the quantity relative to a baseline of zero. These characterizations afford the prediction that *few*, but not *a few*, should be able to sanction a negative polarity item, such as *any*. We see from (10)(b) that this is in fact the case.

I have in general concentrated more on two other sources of justification: proposed semantic descriptions must be able to support a revealing characterization of grammatical structure, and must allow one to represent, in a non-adhoc way, both the similarities and the subtle differences among sets of expressions that are comparable in the conceptual content they invoke. Illustrating both points are the examples in (11), involving different uses and senses of *open* or the participle *opened*.

(11)(a) *A butler **opened** the door.*

(b) *The door **opened** easily.*

(c) *Just then the door **opened**.*

(d) *The door was **opened** by a butler.*

(e) *the **opened** door*

(f) *the **open** door*

These respective senses of *open* and *opened* are diagrammed in Fig. 8, where heavy lines indicate profiling, *tr* identifies the trajector (relational figure), and a circle or ellipse represents the scope of predication.

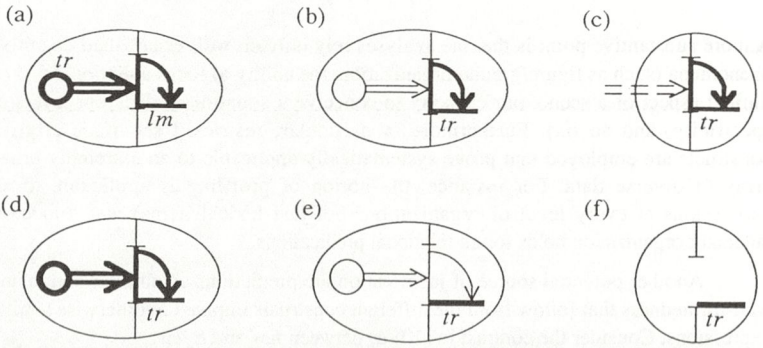


Figure 8

Fig. 8(a) depicts *open* in its use as a transitive verb. It profiles both the transmission of energy (indicated by the double arrow) and the motion that results (represented by the single arrow). Observe that the agent is chosen as trajector, and the mover is singled out as a participant with substantial prominence (hence a landmark). I have argued elsewhere (1982) that the corresponding passive – *be opened* – also profiles this full course of action, as shown in (d). The active/passive contrast does not reside in content or profiling, but only in the choice of trajector. Consequently, the distinctive property of (d) is simply that the mover (rather than the agent) stands out as the figure within the scene.

Next consider (b), *The door opened easily*. This expression does invoke the efforts of an agent (otherwise the adverb *easily* makes no sense), yet somehow we also want to say that it only describes what the door does, not the agent. In the present framework, this amounts to saying that the agent and the force it exerts are included within the scope of predication but remain unprofiled. What (b) profiles – designates – is merely the door's resultant motion. This construction is like a passive in that the mover (or undergoer) is selected as relational figure, but it differs from both a passive and an active transitive by virtue of its limited profile.

Let us now examine the contrast between (b), *The door opened easily*, and (c), *Just then the door opened*. Both involve an intransitive sense of *open* that profiles only the motion of the door (the trajector). The difference is that (c) does not necessarily invoke the conception of an agent or the transmission of energy – the door's motion is portrayed more as a spontaneous occurrence. To be sure, this is a matter of degree, strongly influenced by the accompanying adverbs, but nothing hinges on there being a sharp or absolute distinction. To the extent that we do observe the contrast, it is describable with reference to scope of predication: whether (or to what degree) the scope extends beyond the profiled movement to encompass the force that induces it.

Finally, we must consider the distinction between the stative participle and the simple adjective, i.e. between *the opened door* and *the open door*. Each modifier profiles a particular spatial relationship involving its trajector – precisely the same relationship in both instances. The difference is that an *opened* door has to have undergone the process of opening, whereas an *open* door need not have (e.g. it may

have been placed on its hinges in the open position and never have been closed). In other words, *opened* evokes as part of its base the conception of the transitive event of opening, and within that base it profiles only the final, resultant spatial configuration of the door. By contrast, the adjective *open* has the same profile but does not necessarily include within its scope any conception of the process of opening.

We see, then, that invoking certain constructs required for lexical semantics allows us to describe in conceptual terms the similarities and differences among expressions representing distinct grammatical constructions (active, passive, patient-subject construction, etc.). Perhaps this affords an initial glimpse of how a particular type of semantic description can be said to articulate with a certain conception of grammatical structure in a mutually supportive fashion. Let us now direct our attention to grammar per se. The issue is whether (as one would hope) a workable account of grammatical structure can in fact be devised that posits only symbolic units. Such an account will have to handle all of the phenomena listed in (12), which are generally taken as supporting the autonomy thesis.

(12) The symbolic alternative must account for:

(a) grammatical categories

(b) grammatical rules and constructions

(c) supposed representations and primitives specific to grammar

(d) "semantically empty" grammatical markers

(e) the semantically arbitrary fact that expressions often have to take a certain form, even though another form could perfectly well express the same meaning

(f) non-predictability of the class of elements that participate in a particular morphological or syntactic construction

(g) the apparent ability to judge grammaticality independently of meaning

(h) restrictions that apparently have to be stated in purely formal terms

I will now consider each matter in turn and indicate, at least in very broad terms, how the symbolic alternative can in principle accommodate it.

The first phenomenon is the existence of basic grammatical categories, such as noun, verb, adjective, etc. These are often considered grammatical "primitives", on the grounds that they are not susceptible to semantic characterization – and certainly they are not if one adheres to an objectivist view of meaning. If, however, one adopts a subjectivist view of meaning that properly recognizes the pivotal role of construal, semantic characterizations can be envisaged that are at least coherent (even if not demonstrably valid). In a recent article (1987b), I have made reasonably explicit proposals about what it is that all nouns have in common semantically, and all verbs, as well as their major subclasses (count vs. mass nouns, perfective vs. imperfective verbs). By way of partial justification, I showed that the analysis makes it possible – in the manner of (11) and Fig. 8 – to give precise characterizations of the semantic similarities and differences among various types of relational predications (such as

verbs, adjectives, prepositions, infinitives, present participles, and the several kinds of past participles), and that their meanings allow us to explain much of their grammatical behavior as well as central features of the English auxiliary. I cannot go through the analysis here, but I recommend it as an example worked out in considerable detail of how a symbolic account of grammar that properly recognizes the role of construal is able to make sense of what are usually regarded as purely formal classes, patterns, and restrictions (see also Langacker 1991, chs. 5-6).

Adopting the perspective of cognitive grammar, we can make the generalization that an expression's grammatical category is determined by the nature of its *profile* – it is thus a matter of construal rather than of content per se. For this reason a transitive verb like *open*, its intransitive counterpart, and the stative participle *opened* formed on it can all represent distinct grammatical classes despite invoking exactly the same conceptual content (as sketched in diagrams (a), (b), and (e) of Fig. 8). Now I have already made a broad distinction between expressions that profile *things* and those that profile *relations*, and emphasized that these are technical notions defined quite abstractly (e.g. a thing is a *region in some domain*, not just a physical object). We can now characterize a noun as an expression that profiles a thing, whereas other basic classes – such as adjectives, prepositions, participles, and verbs – designate different sorts of relations. A verb profiles a complex relation that saliently involves *time* in particular ways; I call this a **process.** Other relational predications profile **atemporal relations.**

Some notational abbreviations are given in Fig. 9. A circle abbreviates a thing. A **simple** relationship is represented by a line connecting the relational participants. Some relations are **complex**, in the sense that they do not reduce to a single, consistent configuration but rather comprise a *series* of configurations, or **states**. A process is a complex relation that further invokes the notion of time, in two ways. First, the component states of the process are conceived as being distributed through a continuous span of time, represented by the arrow[4]. Second, a process is temporal in the sense that the conceptualizer scans through the component states sequentially rather than construing it in a purely holistic fashion.

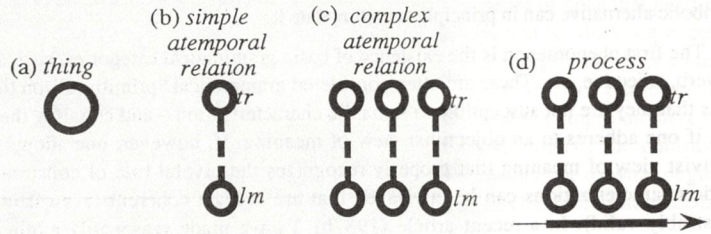


Figure 9

4 How many states are depicted diagrammatically is arbitrary—three are shown in this diagram, just one in others; the important thing is that they form a continuous series.

Some illustration is provided in Fig. 10. The preposition *in* designates a simple atemporal relation involving two things, prototypically a relationship of spatial inclusion. *Into*, on the other hand, profiles a *complex* relation, which does not reduce to a single spatial configuration but resides instead in a series of such relations. Observe that the *final* component state of *into*'s profile matches the *single* component state profiled by *in*. The dotted lines represent **correspondences**; here they show that *into* has the same trajector in all its component states, as well as the same landmark. At least in terms of the spatial path it describes, the verb *enter* is the same as *into*. The major difference is that *into* is merely a complex locative predication, while *enter* – being a verb – highlights the temporal evolution of the spatial relationship, in the ways just described.

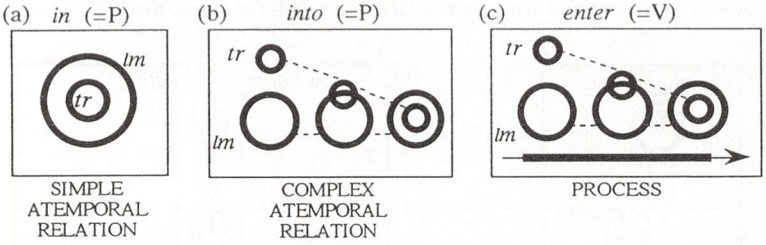


Figure 10

After this all-too-brief discussion of grammatical classes, let us now consider how **rules** and **constructions** can be handled in the symbolic approach. Rules and constructions are actually not distinguished in this framework; in accordance with the content requirement, grammatical rules take the form of *constructions characterized schematically*. That is, rules are simply schematizations over sets of overtly-occurring expressions parallel in formation, representing whatever commonality is observable in these expressions. I thus refer to such rules as **constructional schemas**. Internally, a constructional schema is a complex symbolic structure directly analogous to the expressions it schematizes – it is merely more abstract. The function of a constructional schema is threefold: (i) it captures whatever generalizations are inherent in the primary data; (ii) it is available as a template for constructing or evaluating other expressions on the same pattern; and (iii) its categorization of such an expression constitutes the latter's structural description.[5]

What do I mean by *construction*? A construction is a specific, symbolically complex expression, or else a schematization over such expressions at some level of abstraction. In the simplest case, a construction involves the combination, or **integration**, of two symbolic structures to form a symbolic structure of greater

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5 Let me note in passing that cognitive grammar basically subsumes the theory of **construction grammar** being developed by Fillmore (1988) and others. The major difference is that proponents of construction grammar would not necessarily accept my conceptual characterization of basic grammatical categories, hence it does not achieve the full reduction of grammar to configurations of symbolic structures.

complexity. I will say that two **component structures** are integrated to form a **composite structure**. Their integration is **bipolar**, i.e. it takes place at both the semantic pole and the phonological pole. Integration is effected by *correspondences* established at each pole between substructures of the two components; the composite structure results from merging the two component structures through the superimposition of corresponding entities.

An example should make this clear. Represented in Fig. 11(a) is a simple symbolic structure, namely the noun *balloon*. The picture at the semantic pole is purely mnemonic – it abbreviates the full, multifaceted conceptual complex that constitutes our understanding of this notion[6]. The notation given at the phonological pole similarly abbreviates a complex phonological structure. Note in particular that the ellipse labeled W represents a *word*, and that the arrow labeled T stands for *speech time*.

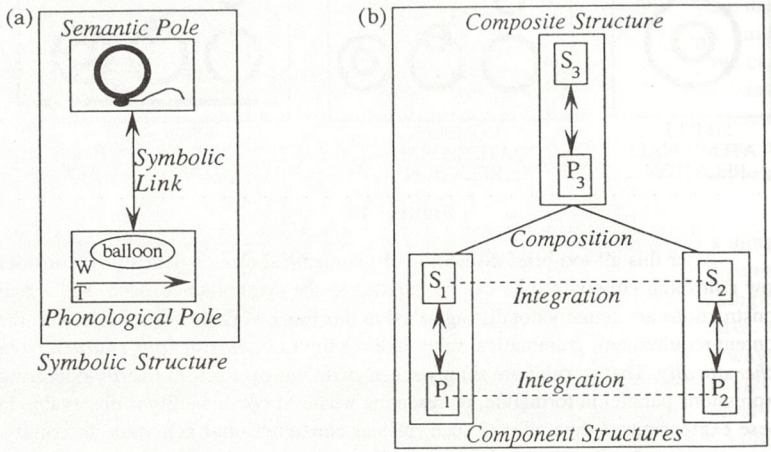

Figure 11

In a simple construction, two symbolic structures of this sort function as component structures, and are integrated to form a composite structure, as shown in Fig. 11(b). The dotted lines indicate the correspondences that effect this integration at each pole. That is, some facet of S_1 is put in correspondence with some facet of S_2, where S_1 and S_2 are the semantic poles of the two component structures. Likewise, some facet of P_1 is put in correspondence with a facet of P_2, where P_1 and P_2 are the component structures' phonological poles. By the superimposition of corresponding entities, S_1 and S_2 merge to form S_3, while P_1 and P_2 merge to form P_3. This is **composition** – it yields a *composite* structure in which S_3 is symbolized by P_3.

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6 I should note that cognitive grammar makes no claim whatever that meaning reduces to visual images, or that drawings done for expository purposes are the formal objects of semantic description. These common misconceptions have no basis in anything I have ever said or written.

Consider the integration of the adjective *yellow* and the noun *balloon* to form the phrase *yellow balloon*. *Yellow* and *balloon* are the two component structures. Their integration at the semantic pole is diagrammed in Fig. 12(a), and their phonological integration in 12(b). At the semantic pole, *yellow* profiles a simple atemporal relation, as previously described (Fig. 5(b)), while *balloon* designates a thing. Recall that the landmark for *yellow* is a region in color space, and its trajector a physical object that is the locus of a color sensation. Semantic integration is effected by a correspondence that identifies this trajector with the thing profiled by *balloon*. Superimposing these entities yields the composite structure shown at the top, in which the locus of the color sensation is specified as being a balloon in particular. Observe that the composite structure designates the *balloon*: its relationship to color space is included within the scope of predication but is unprofiled at the composite-structure level. Hence *yellow balloon*, taken as a whole, is categorized as a (complex) noun.

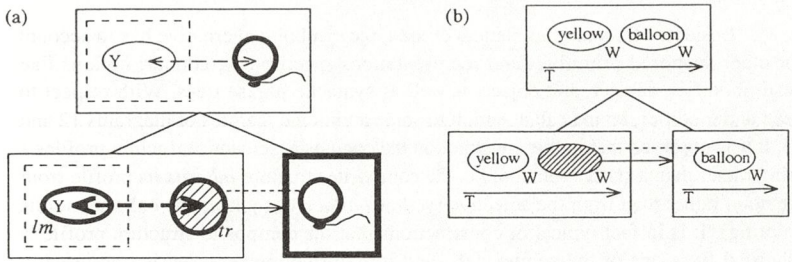

Figure 12

This semantic integration is symbolized by the phonological integration of *yellow* and *balloon*, sketched in Fig. 12(b). Specifically, *balloon* is identified as the word that directly follows *yellow* along the temporal axis. That is, the temporal contiguity and ordering of *yellow* and *balloon* symbolizes their semantic relationship, wherein the property of being the locus for a yellow sensation is attributed to the balloon rather than to some other object.

Yellow balloon of course instantiates a general pattern for the integration of adjectives with nouns in English. In cognitive grammar, that pattern – or rule – takes the form of a *constructional schema*, which is nothing more than a schematization of such expressions. This particular constructional schema is diagrammed in Fig. 13. It is a complex symbolic structure whose internal organization is directly analogous to *yellow balloon* and other instantiating expressions, the only difference being that specific characterizations of the adjective and noun are replaced by schematic characterizations: semantically, they respectively profile a simple atemporal relation and a thing, while phonologically each is described as a word. However, their integration and profiling at the composite-structure level is just the same as in the specific expression. *Yellow balloon* thus participates in a *categorizing relationship* with the

constructional schema, which thereby provides its structural description. Moreover, the schema is available for use as a template in assembling other expressions on the same pattern.

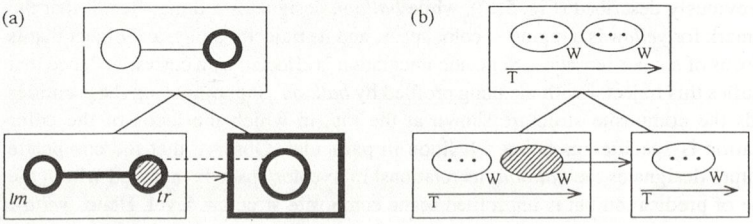

Figure 13

Besides rules and grammatical classes, the symbolic alternative has to account for other supposed primitives and representations specific to grammar: notions like head, modifier, subject, and object, as well as syntactic phrase trees. With respect to head and modifier, let me call attention to some additional features of diagrams 12 and 13. It was observed that in this construction the composite semantic structure profiles a thing rather than a stative relation, i.e. the composite structure *inherits* its profile from the noun rather than from the adjective (*yellow balloon* designates the balloon, not its coloring). It is in fact typical of constructions that the composite-structure profile is inherited from one of the components, and it is this component that is traditionally regarded as the head. The notion **head** is so defined in cognitive grammar. Diagrammatically, it is indicated by the box drawn with heavy lines.

Also observe the cross-hatching and solid arrows in Figs. 12-13. As before, the solid arrows indicate an *elaborative* relationship. In a construction, it is typical for one component structure to elaborate a subpart of the other (this subpart is indicated diagrammatically by the cross-hatching). For instance, *yellow* characterizes its trajector only schematically, whereas in the construction *balloon* characterizes the corresponding entity with considerably greater specificity. We can now define a **modifier** as a component structure one of whose substructures is *elaborated* by the head. *Yellow* thus modifies the head *balloon* in *yellow balloon.*

The notion complement (or argument) can also be defined in these terms. A **complement** is a component structure that *elaborates* one of the substructures of the head. Examples of complements include subjects and direct objects. Consider the verb *enter*, diagrammed in Fig. 10(c), and the sentence *Sally entered the room.* The clausal head is *enter*, since the process it designates is profiled by the clause as a whole. *Sally* elaborates the schematic trajector of this process, and *the room* elaborates its schematic landmark. I would argue that subjects and direct objects are properly characterized as clause-level complements, specifically as nominal expressions that respectively elaborate the trajector and primary landmark of the clausal head. Observe that this characterization is based on semantic notions – profiling, correspondence, level of

specificity – not on any particular constituency or syntactic tree structure. This has important consequences for its general applicability (e.g. in VSO languages).

What about syntactic tree structures? The information they represent seems crucial to linguistic structure, and as conceived in transformational grammar, trees are purely grammatical objects, neither semantic nor phonological (although they are used in semantic and phonological *interpretation*). The kinds of information represented in phrase trees are indeed important. I maintain, however, that such trees – conceived as separate, purely syntactic objects – are superfluous and artifactual.

Phrase trees incorporate three kinds of information: constituency, category membership, and linear order. All of these are accommodated in the present approach positing only symbolic units. Constituency is simply a matter of smaller symbolic units being successively integrated to form progressively larger symbolic structures. This happens when the composite structure at one level of organization functions as a component structure in a higher-order construction. Moreover, a component or composite structure inherently represents a particular grammatical category by virtue of instantiating the schema defining that category. In this approach, category membership is not represented by contentless node labels, but instead resides in categorizing relationships between schematic and specific symbolic structures. Lastly, linear order is in reality *temporal order*, one dimension of phonological space. Temporal ordering is specified as part of the *internal structure* of every expression's *phonological pole*; it is the arrow labeled T in Figs. 11-13. Observe that temporal ordering is distinguished from constituency. The symbolic structures functioning as nodes in a constituency hierarchy are not temporally ordered with respect to one another – rather, temporal ordering is specified *internally* to each node as part of its phonological characterization.

What about so-called "grammatical morphemes", often regarded as semantically empty markings used exclusively for syntactic purposes? I believe that all such markers can in fact be attributed conceptual import and revealingly analyzed as symbolic units. I have tried to show this by taking many of the toughest examples and describing in fairly explicit detail just what I think they mean and how that meaning accounts for their grammatical behavior. Among the "grammatical" elements that I have described in this way are *be*, the auxiliary *do*, the perfect *have*, *-ing*, the past participial morpheme, the nominalizer *-er*, gender markers, the passive *by*, *of*, the possessive morpheme, case markers, etc[7]. There are various reasons why their semantic import has not been generally recognized: because they are highly schematic; because their value is primarily a matter of construal; because they are polysemous; and because they are fully overlapped by the meanings of other elements. From the standpoint of cognitive semantics these reasons are all invalid.

Consider the morpheme *-er*, as in *killer*, *swimmer*, *complainer*, *driver*, etc. As shown in Fig. 14(a), it invokes as its base a highly schematic process, hence it has nothing in the way of *specific* conceptual content. Its import resides in construal: the fact that it profiles the trajector of the schematic process serving as its base. That schematic process is elaborated by a verb stem, such as *kill*, and since *-er* is the head in

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7 See, for example, Langacker 1982, 1987a, 1988a, 1990, 1991.

this construction, it imposes its own profile on the specific process supplied by the stem. A *killer* is thus characterized as the trajector with respect to the process *kill*.

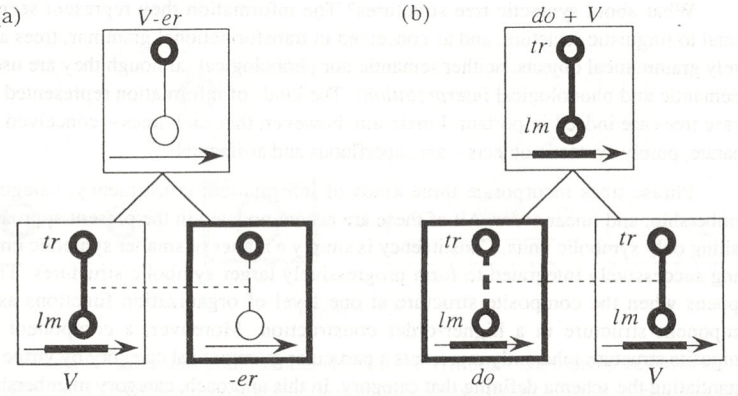

Figure 14

Similarly, the auxiliary *do* is analyzed as profiling a fully schematic process. When it combines with another verb, as in *They do like her*, this schematic process is put in correspondence with, and elaborated by, the specific process profiled by the other verb, as shown in Fig. 14(b). *Do* adds neither content nor profiling – semantically it is fully subsumed by the main verb. But that does not entail that it is meaningless: *meaningfulness is not the same as non-overlapping meaning*. There is semantic overlap of some sort in every construction. The overlap between *yellow* and *balloon* in *yellow balloon* was indicated by the correspondence line in Fig. 12(a). Although each component contributes conceptual content not evoked by the other, the former's schematic trajector is equated with the latter's profile. In Fig.14(a), the conceptual content of *-er* is completely subsumed by that of the verb stem, yet *-er* has a discernible semantic effect owing to the distinct profile it imposes. The overlap is even more extensive in 14(b) because the two profiles correspond. The differences among such examples reside only in the extent (not the existence) of their semantic overlap, and consequently in how "visible" the meaning of *yellow*, *-er*, or *do* is to the analyst. Complete overlap, as with *do*, is merely an expected limiting case.

Examples like *pants*, *binoculars*, *tongs*, *pliers*, *scissors*, *glasses*, *shorts*, *trousers*, *tweezers*, etc. are often cited to show that the *semantic* and *grammatical* notions of plurality have to be distinguished: such forms are grammatically plural but supposedly semantically singular. The argument is fallacious, for it ignores the possibility that the plural morpheme might be polysemous. In its prototypical sense, the plural morpheme designates a set of distinct entities all of which instantiate the same class and could be labeled individually by the singular noun stem. That is not the case with *pants*, *binoculars*, *scissors*, etc., but clearly the occurrence of the plural ending in precisely these forms is not an accident – these nouns designate unitary objects that are nevertheless characterized by salient internal duality. I interpret such duality (and more

generally, multiplicity) as constituting a secondary meaning of the plural morpheme, a natural extension from the prototype.

A standard reason for subscribing to the autonomy thesis is that expressions often have to take a certain form, even though another form could perfectly well convey the same meaning. As an example of such arbitrary formal requirements, consider *government*, for instance the fact that certain prepositions in German (among them *gegen* 'against', *bis* 'until', *durch* 'through', *für* 'for', *um* 'around', and *ohne* 'without') require that their object be marked for accusative case, while others (including *aus* 'out of', *von* 'from', *seit* 'since', *bei* 'by', *mit* 'with', *nach* 'toward', and *zu* 'at') govern dative case. Now first of all, I would argue (as Smith 1987 has done in great detail) that these case inflections are actually meaningful. They appear not to be because the meanings are schematic (e.g. 'goal-directed path' is the accusative prototype), each category is polysemous, and the meanings of the case elements are subsumed by those of the governing prepositions. But let us focus here on the fact that the case markings *have to occur* even though the expressions would be semantically viable without them. Is this not a matter of a certain form being required arbitrarily by grammatical convention?

Though I might quibble about how arbitrary it is, grammatical convention certainly does impose a formal requirement that simply has to be stated, learned, and adhered to. However, this does not establish the autonomy thesis, as I have defined it, because it is perfectly possible to describe the situation in a framework that posits only symbolic units. For example, the fact that *gegen* occurs with accusative case would be specified by means of the constructional schema that we can abbreviate here as [[*gegen* [ACC + NML]]. Abstracted from instantiating expressions (e.g. *gegen einen* (ACC) *Baum* 'against a tree'), this schema details the integration of the preposition *gegen* with a **nominal** (i.e. noun phrase) bearing accusative case. Another constructional schema, abbreviated [[*aus* [DAT + NML]], describes a pattern wherein *aus* takes an object marked with dative case (e.g. *aus dem* (DAT) *haus* 'out of the house'). Granted that the case markers themselves are symbolic structures, the patterns in question are characterized by means of symbolic units alone. The patterns are listed, not strictly predicted, but only symbolic structures figure in the listing.

What about the fact that these patterns are obligatory? That *gegen*, for instance, governs accusative and does not tolerate a dative or caseless object? All this implies is that no constructional schema other than the one that specifies accusative case is available to sanction the integration of *gegen* with a nominal object. No constructional schema allowing *gegen* with, say, a dative object is extracted by the language learner because no expressions of that sort occur to provide the basis for schematization. If such an expression were to be used, it would thus be categorized as an intended instance of [[*gegen* [ACC + NML]], whose specifications it violates.

This example also illustrates the approach taken to arbitrary distributional classes, i.e. the fact that the elements occurring in a particular morphological or syntactic construction are often less than fully predictable, if at all. To indicate that an element does occur in a given construction, one does not tag it with a diacritic or syntactic feature – that would violate the content requirement. Instead, the information

is provided by a constructional schema which specifically mentions that element, such as [[*gegen* [ACC + NML]].

Like construction grammar, cognitive grammar treats general constructions – for instance, the prepositional-object construction – as *complex categories*. Such a construction takes the form of a network, where each node is itself a constructional schema, as illustrated in Fig. 15. This network subsumes specific expressions learned as fixed units; constructional subschemas that mention particular lexical items, like those at the bottom level in the diagram; and more abstract schemas representing higher-level generalizations. The nodes in such a network differ both in specificity and in cognitive salience or entrenchment. I assume a processing model in which the nodes in a network compete with one another for the privilege of categorizing a novel expression. Other things being equal, a lower-level structure wins out over a more abstract structure in this competition, for it overlaps with the target expression in many points of specific detail, each of which tends to activate it. As a consequence, a German prepositional phrase in which a dative follows *gegen* will be judged a deviant instance of the *gegen*+accusative construction, not as a well-formed instance of the higher-level schema which merely specifies the possibility of a preposition taking a dative-marked object. This is admittedly quite sketchy[8], but it may at least indicate that arbitrary distributional restrictions are not per se incompatible with the symbolic alternative. Certainly they do not themselves establish the autonomy of grammatical structure as a separate level or domain of structure (recall the type/predictability fallacy).

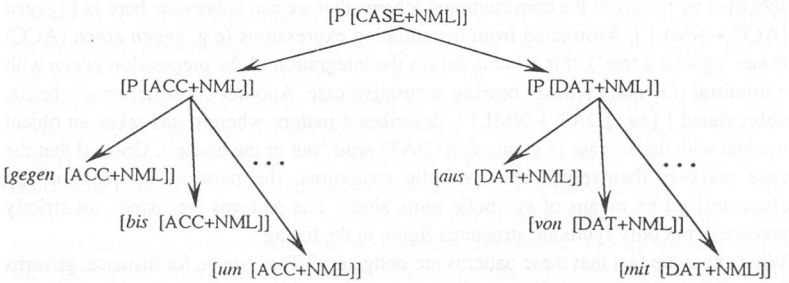

Figure 15

Two more things have to be accounted for: our apparent ability to judge grammaticality independently of meaning, and restrictions that evidently have to be stated in purely formal terms. I will deal with them only very briefly.

The first point is exemplified by that well-known novel sentence *Colorless green ideas sleep furiously*, which is supposedly grammatical though semantically anomalous. Such examples pose no special problem in cognitive grammar, which does recognize the existence of grammatical patterns and restrictions, but simply claims that

8 For more extensive discussion, see Langacker 1988b.

they are fully describable by means of constructional schemas employing only symbolic units. Examples like *Colorless green ideas sleep furiously* involve the proper use of constructional schemas, such that each schematic element is instantiated by a lexical item belonging to the appropriate class, but where certain specifications of these lexical items happen to be mutually incompatible. Consider *green idea*. It represents one possible instantiation of the constructional schema sketched in Fig. 13. This schema however specifies that the trajector of the adjective corresponds to the profile of the noun, with corresponding entities being superimposed to form the composite structure. Now the adjective *green* characterizes its trajector as a physical entity of some sort, whereas *idea* profiles an abstract entity. Thus, when *green* and *idea* are integrated in the manner dictated by the constructional schema employed, entities with incompatible specifications are superimposed, and the result is perceived as semantic anomaly. Still, the expression does instantiate a grammatical pattern, characterized in terms of symbolic units alone.

Finally, what about restrictions that have to be stated in purely formal terms? Classic examples include restrictions on the position of a pronoun vis-à-vis its antecedent (Langacker 1969; Reinhart 1983), as well as constraints on "extraction", e.g. the coordinate structure constraint (Ross 1967 [1986]):

(13)(a) *She likes the blouse but hates the skirt.*

(b) **What does she like but hates the skirt?*

Of course, it is doubtful that such restrictions can in fact be stated just in formal terms. On the basis of well-formed sentences like (14), for instance, Lakoff (1986) has argued that so-called extraction is sensitive to semantic factors that tend to correlate with certain structural configurations but are in fact independent of them.

(14)(a) *What did she go to the store and buy?*

(b) *How much can you drink and still stay sober?*

Moreover, a number of scholars have shown in convincing detail that syntactic island constraints are strongly influenced by functional or conceptual factors (e.g. attention, "dominance", semantic weight) if not altogether reducible to them (Deane 1991; Erteschik-Shir and Shalom 1979; Kluender 1991).

The degree to which such restrictions reflect formal vs. conceptual factors is in any case not critical to the point at hand. For one thing, cognitive grammar does recognize and accommodate the various kinds of relationships depicted in standard syntactic phrase trees – it simply handles and interprets these relationships in a different manner, as distinct aspects of symbolic configurations. In principle, therefore, any patterns and restrictions that do make reference to tree configurations are susceptible to reformulation in symbolic terms. We have further seen that limitations on permissible structures can effectively be imposed by positing an appropriate array of constructional schemas and subschemas. Such restrictions need not take the form of prohibitory statements ascribed per se to the cognitive representation of linguistic structure; an alternative (one that is arguably more plausible psychologically) is to see them as implicit in the positive statement of patterns that do occur (in accordance with the content requirement). Although this class of phenomena has not yet been thoroughly

explored from the standpoint of cognitive grammar, I see no reason to doubt that the framework is capable of imposing necessary restrictions and capturing valid generalizations. In fact, a major contribution to the detailed demonstration of its adequacy in this regard was made in a recent dissertation by Karen van Hoek (1992), which offers a coherent, insightful, and unusually comprehensive account of English pronominal anaphora.

Let me conclude by reasserting the intrinsic desirability of maintaining the symbolic alternative. If the function of language is to effect the phonological symbolization of conceptual structure, then the reduction of grammar itself to symbolic relationships is perfectly natural. This reduction also affords both conceptual unification (lexicon, morphology, and syntax forming a gradation comprising only symbolic structures) and theoretical austerity (by virtue of the content requirement). I suggest, moreover, that sheer familiarity with autonomous grammar tends to obscure a certain respect in which that view – were one to step back and adopt the proper perspective – might well be considered inherently implausible. Semantics and phonology are clearly the *content* domains of language: meanings and sounds are directly apprehended and accessible to the awareness of naive speakers. The same cannot be said for grammar – there is no independently accessible "grammatical content" analogous to the conceptual and phonetic content of linguistic expressions. I therefore regard it as unlikely that grammar would constitute a distinct and autonomous cognitive entity; it is far more plausibly viewed as residing in schematizations of contentful symbolic structures, emerging organically from instantiating expressions (simple and complex) by the mutual reinforcement of their common organizational features. Grammatical structures are *immanent in* and *indissociable from* the form-meaning pairings they schematize, and thus have no independent existence. Eventually I expect this feature of the symbolic alternative to greatly facilitate viable accounts of language evolution, acquisition, and processing.

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