other minds and so on. The resulting CS would be minimal. Hence, premise (3) is false: CS *could* represent meanings without containing world knowledge.

Jackendoff does not address this question. Instead, he directly proposes an alternative model for specialization. For instance, he takes social cognition as involving a specialized mental structure. But he claims that this is a substructure of CS, a "sub-specialization" (Jackendoff 1992a, Ch. 4). We call this the *subdivision model:*

(SM) Domain-specific computations are carried out within parts of CS, and can thus be expressed in language.

If most of our reasoning about specific domains has to be carried out within parts of CS, then CS has to be rich. But why should it be so? Jackendoff could put forward two distinct hypotheses.

The *computational unity hypothesis* claims that CS is a computational module, with a *unique processor,* and that sub-specializations are representational modules, that is, knowledge bases about specific domains.[1] On this hypothesis, domain-specific inferences are construed as logical inferences based on domain-specific premises and effected by a single processor, and this is why they are part of CS. However, such a claim is far from being uncontroversial. Many cognitive psychologists argue that putative "sub-specializations" such as Theory of Mind, carry out their computations independently of each other in a relatively autonomous way, and are possibly situated in distinct, dedicated neural structures (Leslie 1994; Segal 1996). Moreover, if the processor were damaged, it seems that one would lose all propositional computational abilities at once. But this pathology has not been observed.

A weaker hypothesis is that of a *unique representational format.* Jackendoff (2002, p. 220) seems to endorse it. It merely claims that all sub-specializations of CS share a common, propositional format and that all corresponding computations are of a quantificational-predicational character. Their computations need not be carried out by a common processor. However, we do not think that this view has any more plausibility than the hypothesis that some sub-specializations have their computations carried out in *sui generis* formats that are designed for the tasks that they solve. Our understanding of each other's minds plausibly involves propositional representations, but this may be the exception rather than the rule. Moreover, it is not clear whether CS would, in this view, constitute a module in any interesting sense, or whether the hypothesis really differs from generalized delegation and a minimal CS.

To conclude, within Jackendoff's architecture of the mind, the generality of language is compatible with either a rich or a minimal CS. The choice of the former requires that the computational consequences of Jackendoff's representational notion of modularity be at the very least clarified.

ACKNOWLEDGMENTS

Thanks to Roberto Casati for setting up a workshop on Jackendoff's work, and to Ray Jackendoff for discussing issues related to the present argument. Justo acknowledges support by CONICET and Fundación Antorchas, Argentina.

NOTE

1. For further discussion of representational (or intentional) and computational modularity, see Segal (1996).

Neuropsychological evidence for the distinction between grammatically relevant and irrelevant components of meaning

David Kemmerer

Deparment of Audiology and Speech Sciences and Department of Psychological Sciences, Purdue University, West Lafayette, IN 47907-1353.
kemmerer@purdue.edu

Abstract: Jackendoff (2002) argues that grammatically relevant and irrelevant components of meaning do not occupy distinct levels of the semantic system. However, neuropsychological studies have found that the two components doubly dissociate in brain-damaged subjects, suggesting that they are in fact segregated. Neural regionalization of these multidimensional semantic subsystems might take place during language development.

Jackendoff's *Foundations of Language* is, without a doubt, a monumental achievement. It both clarifies and begins to fulfill the deeply pressing need for integration not only within linguistics but also between linguistics and the connected disciplines of psychology, neuroscience, and evolutionary biology.

Here I concentrate on the relation between linguistics and neuroscience. Although Jackendoff points out that a great deal has been learned about the functional organization of various aspects of language in the brain, he doesn't devote much space to exploring how these findings can shed light on current issues in linguistic theory. To illustrate the potential applications of recent neurolinguistic research, I present an example that bears directly on two theoretical topics that are near to Jackendoff's heart: the syntax-semantics interface, and the basic architecture of the semantic system.

As Jackendoff observes, many linguists have been converging on the notion that grammatical constructions consist of morphosyntactic patterns that are directly associated with schematic meanings; and, in order for a word to occur in a given construction, its own meaning must be compatible with that of the construction (Goldberg 2003). Consider the well-known locative alternation:

(1) a. *Sam sprayed water on the flowers.*
b. *Sam dripped water on the flowers.*
c. **Sam drenched water on the flowers.*
(2) a. *Sam sprayed the flowers with water.*
b. **Sam dripped the flowers with water.*
c. *Sam drenched the flowers with water.*

The construction in (1) has the broad-range meaning "X causes Y to go to Z in some manner," whereas the one in (2) has the broad-range meaning "X causes Z to change state in some way by adding Y"; each construction also has a network of more restricted narrow-range meanings that are essentially generalizations over verb classes (Pinker 1989). *Spray* can occur in both constructions because it encodes not only a particular manner of motion (a substance moves in a mist) but also a particular change of state (a surface becomes covered with a substance). However, *drip* and *drench* are in complementary distribution, for the following reasons. One of the narrow-range meanings of the first construction is "X enables a mass Y to go to Z via the force of gravity," and this licenses expressions like *drip/dribble/pour/spill water on the flowers* and excludes expressions like **drench water on the flowers.* Similarly, one of the narrow-range meanings of the second construction is "X causes a solid or layer-like medium Z to have a mass Y distributed throughout it," and this licenses expressions like *drench/douse/soak/saturate the flowers with water* and excludes expressions like **drip the flowers with water.*

According to the Grammatically Relevant Subsystem Hypothesis (GRSH), a fundamental division exists between, on the one hand, semantic features that determine the compatibility between verb meanings and constructional meanings, and on the other, semantic features that capture idiosyncratic nuances of verb meanings, for example, the featural distinctions between *drip, dribble,*

pour, and *spill,* and between *drench, douse, soak,* and *saturate* (Pinker 1989; see also Davis 2001; Hale & Keyser 1993; Mohanan & Wee 1999; Rappaport Hovav & Levin 1998).

Jackendoff cites Pinker's (1989) analysis of verb-based constructions approvingly, but he is apparently skeptical of the GRSH. In *Foundations* he states that the hypothesized independent level for grammatically relevant meaning "exhibits no interesting semantic constraints beyond its coarseness relative to lexical distinctions" (p. 290), and he offers the following alternative proposal: "The subset of semantic features relevant to grammar is just the subset that is (or can be) mentioned in phrasal interface rules" the part of conceptualization that is "visible" to these rules? (p. 291).

Now, if grammatically relevant and irrelevant components of meaning are segregated, as the GRSH maintains, then they are probably subserved by at least partially distinct neural structures. Therefore, it should be possible for them to be impaired independently of each other by brain damage. I have been conducting a series of studies with aphasic subjects to test this prediction, and have obtained results that are consistent with it. The first study focused on the locative alternation and revealed the following double dissociation (Kemmerer 2000a). One subject failed a verb-picture matching test that evaluated her ability to discriminate between grammatically irrelevant aspects of verb meanings (e.g., *drip-pour-spill*) but passed a grammaticality judgment test that evaluated her knowledge of the grammatically relevant semantic features that determine which constructions the very same verbs can occur in (e.g., *Sam spilled beer on his pants* vs. **Sam spilled his pants with beer*). In contrast, two other subjects manifested the opposite pattern: They passed the matching test but failed the judgment test. Moreover, their errors on the judgment test were most likely due to grammatical-semantic rather purely syntactic deficits, because they performed well on a separate test that addressed simple clausal syntax. Three subsequent studies focusing on various constructions found robust one-way dissociations involving subjects who passed tests of grammatically irrelevant meaning but failed tests of grammatical relevant meaning (Kemmerer 2000b; 2003; Kemmerer & Wright 2002; see Breedin & Saffran 1999; Marshall et al. 1996, for additional reports of the reverse type of dissociation; see Druks & Masterson 2003; Shapiro & Caramazza 2002, for other pertinent studies).

Although this research has just begun, the initial findings support the GRSH and challenge Jackendoff's view. It is possible, however, that the two competing positions could eventually be reconciled in the following way. The neural structures that implement grammatical semantics might not be genetically programmed for this function; instead, through as yet unknown mechanisms of self-organization (perhaps like those simulated by Kohonen networks), these structures might become functionally specialized over the course of language development as the child formulates increasingly abstract semantic generalizations over verb classes that are associated with certain morphosyntactic frames. This kind of approach could accommodate not only the neuropsychological data, but also recent typological data on extensive crosslinguistic variation in grammatical semantics (Croft 2001; Haspelmath 2003; Slobin 1997; Zhang 1998), as well as recent psycholinguistic data on the acquisition of grammatical constructions (Tomasello 2003).

Finally, and on a more positive note for Jackendoff, neuroscientific studies strongly support his proposal (p. 350) that certain semantic features of action verbs are not algebraic but rather motoric and visuospatial in character (e.g., Breedin & Saffran 1994; Kable et al. 2002; Kemmerer & Tranel 2003; Pulvermuller et al. 2001; Rizzolatti et al. 2001; Stamenov & Gallese 2002; Tranel et al. 2003).

Interestingly, these semantic features tend to be grammatically irrelevant, a point that Jackendoff recognizes and that deserves closer attention from scholars in both linguistics and cognitive neuroscience.

A mixed treatment of categoricity and regularity: Solutions that don't do justice to a well-exposed complexity

René Joseph Lavie

UMR 7114 Modèles, Dynamiques, Corpus (MODYCO), Université Paris 10 et CNRS, 92000 Nanterre, France. **rlavie@waika9.com**

Abstract: Jackendoff's position with respect to categories (for lexical items and larger constituents) is unclear. Positing categories is (1) implausible in several respects; (2) it makes the binding problem in language seem more massive than it actually is; and (3) it makes it difficult to explain language acquisition. Waiting for connectionism to fulfill its promise, a different track is sketched which is residually symbolic, exemplarist, and analogy-based.

This commentary bears only on Jackendoff's position on categories in *Foundations of Language* (Jackendoff 2002), although there would be much to say on other subjects. (For example, how is the simplest metonymy to be accounted for with the overly simplistic vision of semantics that is advocated?) I will understand "category" – following conventional usage in linguistics – as lexical categories, grammatical categories (including rules), and functional categories.

While several authors today are giving up categories – or making efforts to that end – *Foundations* takes a position on categories which is not entirely clear to me. On p. 24, speaking about "the theoretical claims" that "words belong to syntactic categories" and that "words group hierarchically into larger constituents that also belong to syntactic categories," Jackendoff reminds us that many different notations (trees, bracketed expressions, boxes) may be used. A possible reading of the passage is that Jackendoff is endorsing the claim itself (besides the variety of notations, there would be, unarguably, a categorical structure). But, in many other places in the book, it is clear that the author takes the necessary distance with respect to categories. However, in Chapter 5 "The parallel architecture," which is central to the definition of Jackendoff's proposal, lexical categories are pervasive in the text; there isn't an explicit statement that they are rejected by this theory, nor is there an explicit statement showing how linguistic phenomenology is to be accounted for *without* categories. In general, the author's statement of the "massiveness of the binding problem" (addressed below in this commentary) can be understood only under the assumption of categories. In short, the book ultimately seems to me to be ambiguous as to whether it endorses lexical categories (then, how would that be compatible with the difficulties that Jackendoff himself raises?), or whether it rejects them (in which case, I am not sure I perceive what theoretical devices are called for, for a precise account of linguistic phenomenology).

In any case, there is a theoretical obstacle to positing categories: that of implausibility, recognized by Jackendoff himself. "It is obvious that speakers don't have a direct counterpart of the symbol NP in their heads" (p. 24).

There is also the obstacle of coping with the linguistic facts. The evidence is abundant, for example, in the decades of work done by Maurice Gross at the University of Paris 7, which showed that in French there are no two verbs with exactly the same distributional behaviour (Gross 1975, p. 214). It may be the case, however, that attaching lexical items to several categories, with multiple inheritance – as proposed in *Foundations* – makes it possible to address the variety of distributional behaviours, but this remains to be shown through detailed work on extensive linguistic data. Still, there would remain problems with plausibility, learnability, and language change.

Constructions, as proposed in *Foundations,* are categorical in the sense that they are abstract, and based on the lexical categories. However, the proposed theory seemingly accepts – as does Goldberg (1995) – as many constructions as wanted, and organizes them into an inheritance lattice (pp. 183–87). This reduces