proves that syntax and morphosyntax are closely related in the brain, as it is assumed in the model of modern architecture of language proposed by Jackendoff (p. 261). However, this does not mean that syntactic capacities are implemented in a single area.

The lack of complete overlap of brain areas involved in syntactic and morphosyntactic processing is in agreement with most of the linguistic models. It must be underlined, however, that the role of working memory in syntactic processing is more or less ignored by the linguistic models. It seems to be "understandable" if we take into account the complexity of the relationship of working memory and sentence comprehension. Working memory may play a different role in assigning the syntactic structure of a sentence, and in using this structure to determine the meaning of it. The complex relationship of syntactic complexity and working memory load is proven by patients' data. Pickett et al. (1998) report on a patient with mild Parkinsonism who showed perseverations in rule applications, impaired comprehension in sentence meaning conveyed by syntax, and intact verbal and visual short-term memory. The striking dissociation shown by the patient was that her sentence-comprehension performance increased proportionally with syntactic complexity. We may assume that the most probable areas playing a crucial role in such a memory-syntax interface are frontal regions of the cortex.

Jackendoff mentions the possible role of working memory (WM) in language processes several times in his book and his most elaborate remarks are related to the distinction between Baddeley's WM model and his own linguistic working-memory concept. I agree working memory is not just a "shelf where the brain stores material" (p. 207), but also a workbench that has a complex relationship with constructing verbal structures. From this point of view, Baddeley's model has a limited capacity in explaining the relationship between WM and the integrative and interface processes.

However, a different model of working memory from Just and Carpenter (1992) may fit better with Jackendoff's parallel grammar model. In the Just and Carpenter model of functional working memory, henceforth referred to as f-WM, storage is defined as temporal retention of verbal information already processed, while processing is defined as computations generating various types of linguistic representations (lexical, morphological, grammatical). In one of the f-WM studies by Montgomery (2000), the relation of WM and immediate processing of simple sentence structures was investigated in SLI children and two control groups, age matched and receptive syntax-matched controls. The SLI group showed deficits in all f-WM tasks and was very slow as compared to the control groups. However, immediate processing of simple sentences does not rely heavily on f-WM resources, so the problem may be more related to integrating the resources associated with different subsystems of the linguistic working memory.

Given the distinctions between Baddeley's WM model and the f-WM model we may assume that the f-WM model is closer to Jackendoff's assumption on linguistic working memory than to Baddeley's previous or recent models (Baddeley 2003). The Just and Carpenter model assumes that items activated in the working memory are integrated into larger chunks. The model is not far from that of Jackendoff's idea on the linguistic working memory included in the parallel grammar that heavily relies on item integration. The task of neuroscience would be to shed light on possible neural functions related to the subsystems assumed. If Jackendoff is right about the integrative function of linguistic working memory as an inherent part of the three linguistic structures, brain activity correlates should be associated with it. It is really mysterious how the items retrieved from long-term memory undergo transient processing in working memory and how they are related to brain mechanisms. However, I do think that the problem is that we haven't yet found the right experimental paradigms for investigating these processes.

Beyond beanbag semantics

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Abstract: Jackendoff's "mentalistic" semantics looks more radical than it is. It can best be understood as a necessary corrective to the traditional oversimplification that holds that psychological variation "cancels out" on the path from word to world. This reform parallels the "evo-devo" reform in evolutionary biology.

Mendel's genes were a brilliant simplification that permitted many of the fundamental principles and constraints of inheritance to be clearly described and tested. But if you took them too literally, imagining them to have exact counterparts lined up like simple beads strung on the chromosomes, you got "beanbag genetics," as Ernst Mayr once dismissively called it. The working parts of the DNA inheritance machinery encountered in contemporary molecular genetics are so much more subtle and active than Mendelian genes, that some would declare that genes – the genes Mendel introduced to us – do not exist at all! *Eliminative materialism* regarding genes in the Age of Genes? An unlikely terminological reform. We don't throw the Mendelian ladder away; we continue to use it, with due circumspection and allowances (Crow 2001; Haldane 1964).

Jackendoff's masterpiece *Foundations of Language* (Jackendoff 2002) poses a counterpart question: Isn't it time to trade in Chomsky's pathfinding syntactocentric vision for something more complex in some ways and more natural in others? In the syntactocentric picture, a word is a simple, inert sort of thing, *a sound* plus *a meaning* sitting in its pigeonhole in the lexicon waiting to be attached to a twig on a syntactic tree. In Jackendoff's alternative vision, words are active: "little interface rules" (target article, sect. 9.3, para. 6) with lots of attachment prospects, links, constraints, affinities, and so on, carrying many of their combinatorial powers with them. Jackendoff's proposed parallel architecture, with its three simultaneous and semi-autonomous generative processes, is biologically plausible, both neuroscientifically and evolutionarily. It opens up a space for theory modeling in which hypotheses about opponent processes, recurrence, and other sorts of mutual interaction, can be formulated and tested. The Universal Grammar (UG) doesn't need to be written down as rules to be consulted. It is partly embodied in the architecture, and partly fixed by culturally evolved attractors homed-in on by individual learning. The epicycles of syntactocentric theories largely evaporate, as the division of labor between syntax, semantics, and phonology gets re-allotted.

Any revolution is apt to look more outrageous in prospect than it turns out to be in retrospect. I would like to propose a friendly amendment, softening the blow of Jackendoff's "mentalistic" semantics. Semantics, as traditionally conceived by logicians, philosophers, and linguists, is where the rubber meets the road, where language gets all the way to the world and words refer to the things and events therein. The winding path by which a word "gets to" the world, when it does, surely lies in the mind (or brain) of a language user, but tradition has it that this messy intermediary can and should be largely ignored. There are several influential bad arguments as to why this should be so, but here's one that can stand for them all:

"My uncle is suing his stockbroker." When you hear that sentence, and understand it, you perhaps engage in some imagery, picturing an adult male (in a suit?) with some papers in his hand, confronting, somehow, some other man (why a man?), and so on. There would no doubt be wide variation in the imagery in the minds of different hearers, and some might claim that they engaged in no imaging at all and yet still understood the sentence just fine. Moreover, such imagery as people did indulge in would be unable on its own to fix the meaning of the sentence (there is nothing an uncle looks like that distinguishes him from a father or

brother). Clearly, goes the argument, the idiosyncrasies of imagery or other mental processes we each indulge in are irrelevant to the issue of semantics – the word-world relation that specifies, somehow, the set of objects in the world correctly referred to by "uncle," "sue," and "stockbroker." So, we cancel out all the conflicting and irrelevant mental states and processes and leave the messy minds out of semantics altogether. In any case, since we semanticists have to get all the way to the world in the end, it won't do to stop short in the mind (or the brain), so why tarry?

This is strikingly like the justification that has been offered by evolutionists for habitually ignoring developmental biology: We choose to go from the gene directly to the adaptation, the phenotypic structure or behavior that is actually selected for, because that is, in evolution, where the rubber meets the road. A gene for *x*, a gene for *y*, and we can postpone indefinitely the tricky job of charting the winding path from gene transcription to operational phenotypic asset. This is in fact a very valuable simplification, but it can be overdone. Reacting against it – today's "evo-devo" bandwagon – can overshoot, too.

Jackendoff says, in italics, *"it is necessary to thoroughly psychologize not just language, but also 'the world'"* (p. 294) and adds: *"the perceptual world **is** reality for us"* (p. 308). As he recognizes, this looks as if he's stopping semantics in the brain, saddling his brilliant view of language with some weird sort of materialistic idealism. Let me try to put the matter more mundanely. Most people go through life without ever giving semantics any thought. You don't have to figure out the semantics of your own language to use it, but if you do try to, you soon discover the set of issues that exercise Jackendoff. It helps keep the quandaries at bay to go *hetero-*, to do the semantics of some other guy's language (and mind). Like this:

The words of his language refer to things. We mustn't presuppose that his semantic system matches ours – the meta-language we use to *describe* his psychology. If we want to say what his words refer to, we have to see how his brain is designed by evolution (including cultural evolution) and by individual learning, to parse out his perceptual and conceptual world. Once we've done this we can ask: Do his terms refer to things in the world *as we parse it,* or "just" to things in the world as he experiences it (and as his conspecifics and companions experience it)? (For if there is a language, there is a shared system even if it isn't *our* shared system.) If the former is true, then we share the world with him; our *manifest image* (Sellars 1963) is (roughly) the same as his, and theirs. If not, then we have to maintain something like scare-quotes when we refer to the "things" in his world. But either way, we eventually get all the way out to the world – where the rubber meets the road. What we can't *express* in our terms, we can *describe* in our terms.

Jackendoff insists, rightly in my opinion, that it is only by taking this indirect path that analyzes the manifest image implicit in the language-users' brains that we can complete the task of linguistics. For most purposes, however, we can continue using the traditional semantical talk about the word-world relation, just as biologists can continue to talk about genes for myopia or even dyslexia (Dawkins 1982; Dennett 1995), because we know how to take the longer, more complicated path when necessary.

A conceptuocentric shift in the characterization of language

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Abstract: Recognizing limitations of the "syntactocentric" perspective, Jackendoff proposes a model in which phonology, syntax, and conceptual systems are each independently combinatorial. We can ask, however, whether he has taken this issue to its logical conclusion. The fundamental

question that is not fully addressed is whether the combinatorial aspect of syntax originated in, and derives from, the indeed "far richer" conceptual system, a question to be discussed.

In *Foundations of Language,* Jackendoff (2002) has undertaken what is finally a rather profound reconfiguration of the generative framework in a manner that allows a potentially much more interesting interaction with related aspects of the other cognitive sciences. Recognizing limitations of the "syntactocentric" perspective, in which the free combinatoriality of language is attributed to syntax alone, Jackendoff proposes to correct the situation by promoting a model in which phonology, syntax, and the conceptual system are each independently combinatorial.

Of particular interest is the status of the conceptual system as a "combinatorial system independent of, and far richer than, syntactic structure" (p. 123) in the parallel architecture, and the resulting questions concerning the functional relation between the conceptual and the syntactic components. In this aspect, Jackendoff has initiated an interesting debate, but in a certain sense he has failed to take his position to its logical conclusion. The fundamental question that is not fully addressed is whether the combinatorial capability originated in the indeed "far richer" conceptual system. This is consistent with the consideration that language arose primarily to enhance communication (p. 236) of thoughts, which assumes the precondition of a combinatorial conceptual structure system (p. 238).

If the combinatoriality of language serves the purpose of transmitting messages constructed from an equally combinatorial system of thoughts (p. 272, and Ch. 3), then the precedence for combinatoriality appears to lie in the thought or conceptual system. In this case, it would have been more interesting to see Chapter 3 on combinatoriality organized around the combinatoriality of the conceptual system, with an analysis of the extent to which the combinatoriality of syntax derives from that of its predecessor.

In any event, Jackendoff's view of the conceptual system invites one to consider things from a more conceptuocentric perspective. Indeed, Jackendoff notes that (p. 417) "languages differ in their syntactic strategies for expressing phrasal semantics; but the organization of what is to be expressed seems universal," again suggesting that the origin of the universal combinatorial capacity lies more in the independent combinatorial capability of the conceptual system than in syntax. In this context, one could consider the syntactic integrative processor as an algorithm for reading or traversing the conceptual structure data structure in order to generate a linear string that would be processed in parallel by the phonological integrative processor. In this sense, the observed generative component of syntax would derive from that of the conceptual system. Indeed, on page 417 Jackendoff indicates that "what *is* part of Universal Grammar, of course, is the architecture of the interface components that allow conceptual structures to be expressed in syntactic and phonological structures." The interesting part of what is universal then, is the conceptual system and its interfaces.

If this were the case, then the syntactic integrative processor would perform an interface between conceptual and phonological structures. This perspective focuses on the relation between the structure of language and the structure of meaning, more than the syntactocentric approach does. In this context, one would expect a certain degree of isomorphism between conceptual structures and the linguistic structures that communicate them. Jackendoff thus notes that for "simple compositional" structure based on argument satisfaction, modification, and lambda extraction and variable binding, there is a "close correspondence between the configurations of lexical items in syntax and conceptual structure" (p. 387). Enriched composition such as the reference transfer depicted in Nunberg's (1979) sentence "The ham sandwich over in the corner wants more coffee" manifests situations in which this iconicity is claimed to break down. Indeed, the development and use of this type of "verbal shorthand" will lead to the development of grammatical constructions that partially circumvent iconicity, here simply referring to an individual by his or her most contex-