the interpreter something to bind descriptive information to. Although DRT accounted nicely for the fact that indefinites in the scope of negation cannot bind pronouns in subsequent sentences, for example, "*Joan did not buy [a car]$_1$. *[It]$_1$ is a Jaguar,*" the box notation Jackendoff introduces does not use boxes to characterize accessibility constraints for pronoun resolution, neither does it have a proper semantics in which valid inferences can be characterized.

We part company when, rather surprisingly, Jackendoff is lead to conclude that "there is little to be gained in theoretical economy or explanatory adequacy by making a strict cut between logical and non-logical properties . . . logical properties are just some heterogeneous subset of semantic properties" (p. 289). What is logical and what is not depends on one's choices in modelling meaning, but anyone must make such choices. If one desires to model inference as a matter of form, irrespective of content, an inference is logically valid just in case the premises entail the conclusion in every possible model, for its validity must depend only on its logical constants. Choices of the modeller also determine the furniture of the models: I concur entirely with Jackendoff's "yes" to events and "no" to possible worlds. But he erroneously believes that variables for places are new with his conceptual semantics (p. 322), for Situation Semantics already introduced locations as constituents of their situation types (Barwise & Perry 1983). Truly puzzling is his later usage of lambda-abstraction, usually forming functions from truth-value denoting expressions, but now filling terminal nodes in conceptual tree structures with semantic objects as labels of higher nodes (p. 389). For this technique familiar from model theoretic semantics to do any work, the tree structures must be given a semantics, specifying in a Fregean, compositional way how functions and arguments may be composed to compute appropriately typed values. It can be adopted in DRT as well, assisting in separating compositional aspects of meaning from constraining accessibility in declaring reference markers, and opening a route to alleviate representation by delegating more to inference rules, as in Blackburn and Bos (1999). No semantics, no inference; no inference, no interpretation; no interpretation, no understanding!

What we badly need in order to advance the scientific study of human language understanding is a novel language, a scientific pidgin to communicate across different tiers of modelling meaning. Our explanatory theories need not be incommensurable, if we strive to integrate the various explanatory toolkits carefully and systematically. Because Jackendoff has written his book to promote a culture of collaboration, he should be responded to by incorporating the many useful insights, such as the three aspects, sensory, material, and constitutive, of his "telic quale" into current theories of meaning and interpretation.

The architecture is not exactly parallel: Some modules are more equal than others

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Abstract: Despite its computational elegancy, Jackendoff's proposal to reconcile competing approaches by postulating a parallel architecture for phonological, syntactic, and semantic modules is disappointing. We argue that it is a pragmatic version of the leading module which Jackendoff would probably prefer, but which he does not explicitly acknowledge. This internal conflict leads to several shortcomings and even distortions of information presented in the book.

Foundations of Language: Brain, Meaning, Grammar, Evolution (Jackendoff 2002) presents a major revision of the syntactocentric approaches in contemporary linguistics. It may well become an established interpretation for the next decades, especially in view of difficulties with an empirical refutation of such a multicomponent model. Taking apart the delicate question of what belongs to an interface and what is a core module of one or another domain (the answer may in fact vary for different languages), we would like to comment on another issue central to Jackendoff's approach: the overall architecture and its relations to the function of linguistic mechanisms. As in the case of several other, presumably parallel, mechanisms of processing (e.g., dorsal and ventral streams of visual processing, or semantic and episodic memories), what is stressed in the book is the parallelism, not the hierarchical organization of the modules. Clearly, Jackendoff also undermines systematic asymmetries in the relationships of the constituent mechanisms.

When considering language use from a functional point of view, that is, as goal-oriented activity, a distinction between leading versus background functions should be made. For the whole domain of language, such a leading function is the communication of meaning and enhancement of social coordination. Variable and progressively automated syntactic and phonological processes are only means to achieve this general goal. This is also what Jackendoff emphasizes when he writes, "Phonology and syntax, after all, evolved to *express* meaning, which has a far longer evolutionary pedigree. Moreover . . . much of conveyed meaning is tacit, not expressed at all in the words uttered or the syntactic structure combining them" (p. 428). The testimony to a priority of meaning evaporates when the modular architecture starts to be discussed.

The problem is not so much that semantics is "only equated" in its role to phonology and syntax. Strangely, the upper level – variously named as pragmatic, executive, or metacognitive – is nearly overlooked. When Jackendoff writes that interpersonal tuning ("attunement," or also "alignment"; see Pickering & Garrod, in press) is "the last piece" (p. 322) in the overall picture, our impression is that it has to be the first, and not only in evolutionary or ontogenetic considerations. For instance, recent experimental data consistently prove that interpersonal (pragmatic) variables, such as addressees' needs, influence syntactic forms early in online processing (Lockridge & Brennan 2002).

There are even some distortions and omissions, amounting to cognitive scotomata, in this otherwise precise and almost exhaustive text. For example, take Jackendoff's entire line of analysis of communication and interpersonal cognition. Jackendoff mentions the "theory of mind" only once, in a footnote on page 323, where its development is attributed to the fifth year of life; whereas in fact it culminates (with a relatively difficult false-belief task) already in the fourth year (see Perner & Lang 1999, among many others) and, what is important, it has a long history of earlier achievements, such as a "social cognitive revolution" at nine months (documented by Tomasello 1999a), when children start to consider other people as intentional agents. The related steps are self-recognition in a mirror test and empathy for others, both important motives for communication. Further, Jackendoff ignores completely the rich research literature on joint-attention effects (not to be confused with the less specific idea of joint intention) in language development and practical interaction.

The second scotoma is the virtual lack of neurolinguistic and neuropsychological data although, ironically, "brain" is the first word in the subtitle of the book. The prefrontal cortex is of particular importance as the crucial part of interpersonal neurocognition in that its damages correlate with autism and the underdevelopment of language (e.g., Stuss et al. 2001). Relevant data demonstrate that prefrontal executive functions go beyond working memory, being connected to attentive processing, task switching, and resource allocation (the dorsolateral prefrontal cortex) and to emotions, self-reference, and social behavior (ventromedial and frontopolar areas). This is where we should look for brain mechanisms of not only joint intention, but also joint attention and creative usage of language in situated collaborative actions.

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These examples show how thorny is the path from the one-sided conceptualizations of the last half-century. The book demonstrates certain first cautious steps. Universal Grammar (UG) is now seen as an attractor state. Semantics has been equated to phonology and syntax. The latter has been reduced, in its protoform, to simple (and thoroughly pragmatic) heuristics of the type: "first noun is the actor" and "focus first" – which is already known from the literature on child development, as well as from aphasiology (e.g., Velichkovsky 1996). However, for a reader from the discourse-and-activity-oriented camp, this formidable work is also an illustration of the attractor power of generative grammar, which is still preventing the due revision and proper integration of linguistics with the rest of cognitive science. Sooner or later, we will certainly come from UG to something like *UP,* that is, the *universal pragmatics* of cooperative action, with exact solutions for syntactic peculiarities of different languages (Greenberg 1986; Kibrik 2001).

Linear order and its place in grammar

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Abstract: This commentary discusses the division of labor between syntax and phonology, starting with the parallel model of grammar developed by Jackendoff. It is proposed that linear, left-to-right order of linguistic items is not represented in syntax, but in phonology. Syntax concerns the abstract relations of categories alone. All components of grammar contribute to linear order, by means of the interface rules.

1. The problem of linear order. One of the important lines of thought in Jackendoff's (2002) book *Foundations of Language: Brain, Meaning, Grammar, Evolution* is that Generative Grammar (GG) was wrong in presupposing syntactocentrism, the view that only syntax generates structures and that these structures are merely interpreted by the other components of grammar, phonology, and semantics. Syntactocentrism should be replaced by a parallel architecture of grammar, which gives phonology, semantics, and syntax equal rights in the grammar.

In this commentary, I will argue that the case against syntactocentrism should be carried one step further: The division of labor between syntax and phonology is not complete in Jackendoff's present description of these components. I propose that linear order has no place in syntax; order (what remains of it after syntactic and semantic constraints have had their say) is under the control of phonology or the syntax-phonology interface rules. In other words, while Jackendoff claims that syntactic structure represents (a) categories, (b) linear order, (c) constituency (p. 24), I would like to propose that (b) be removed from this list.

2. Why syntax is neither necessary nor sufficient. In discussing possible steps in the evolution of language (Ch. 8, pp. 255ff), Jackendoff uses a set of examples in which syntax does not specify the position of a phrase within the sentence. As demonstrated here, sentence adverbials are free to occur before or after the sentence, or in the major break of the sentence. That is, the model proposed by Jackendoff is very explicit about the fact that syntax underdetermines the actual linear order of constituents in a sentence.

It is also well known in general that some ordering phenomena crucially relate to nonsyntactic information. Perhaps foremost among these phenomena are the so-called "heaviness shifts," that is, presumed movement operations which shift heavy, that is, long constituents toward the left or right edge of a sentence. I claim that length in these cases is phonological length, measured perhaps in number of syllables or phonological words, and cannot be measured in terms of number of grammatical words or syntactic complexity. In considering the syntax-phonology relation, Jackendoff points to examples in which prosodic demands, such as heaviness, are active in overridng syntactic requirements (pp. 120f). For cases such as these, the conclusion must either be that prosody (heaviness) can override syntactic rules, or that syntax simply has nothing to say about the actual order.

The parallel structures proposed by Jackendoff are synchronized by the use of subscripts identifying corresponding pieces of information (such as words). Now, given the fact that the phonological structures as given in Figure 1.1 of *Foundations* and throughout the book are fully specified with respect to linear order, all other order information, in the syntax or in the semantics, is redundant and superfluous. Any information on the linear order of a linguistic expression can be read off the phonological structure. We note in passing that semantic structure is ignorant as to linear order. It is only in the syntax that ordering information is duplicated. Within a discussion of constraints on syntactic rules (Ch. 3, sect. 3.2.3), Jackendoff actually lifts this observation into an interface constraint for the correspondence of syntactic and phonological structures (17b, p. 50): "The linear order of elements in phonological structure (normally) corresponds to the linear order of corresponding elements in syntactic structure." This does not do away with the redundancy.

Second, the sort of syntax advocated by Jackendoff right from the beginning of his book is characterized by a considerable amount of abstractness, by structural elements which do not contain actual words in their actual order. For example, the syntactic structure of *The little star's beside a big star* (p. 6 and later) has terminal elements consisting of grammatical features alone. Their position in the tree bears little relation to the fact that they are (often, but not always) realized at the end of their respective words. Some syntactic items can also be "unpronounceable," as noted on page 13. For such elements, it makes no sense to specify ordering information, whereas information on the dominating constituent is relevant, in fact crucial. The same point holds for lexical items: While it makes sense to place the past tense morpheme in the word *devoured* at the end of the syntactic structure for this word (see [6] in Ch. 6.2.3), it does not make sense for the irregular verb *ate,* as in (7). As the placement of the regular *-ed* suffix is also specified in the phonological structure of *devoured,* I conclude that it is more adequate to let the syntax be ignorant about the linear order of inflectional morphemes.

Finally, in his discussion of a possible time-course of incremental language evolution, Jackendoff characterizes the protolanguage "concatenation of symbols" as the "beginning of syntax" (p. 241). It is not clear whether this connection is a necessary one. A juxtaposition of symbols in a protolanguage could well be "syntagmatic phonology," for example syllabic concatenation, going hand in hand with "the beginning of semantics." In a similar vein, Jackendoff explicitly questions (pp. 252–53, Note 11) the usefulness of versions of syntax with unordered trees. Here, he argues that it would be against the spirit of an evolutionist account of language competence not to assume that syntax contains information on linear order. I fail to see why linear order in a protolanguage must be in the domain of syntax. If the assumed protolanguage has some linear order, this order can just as well be under the control of other components.

3. The proper role of syntax in grammar. The elementary formal notions of phrase structure syntax are those of domination and sisterhood (co-domination), but not that of linear order. Two nodes A and B co-dominated by a node C are necessarily adjacent in a binary structure, but no right-to-left relationship need be assumed. Consider an elementary (but quite powerful) phrase structure syntax allowing for a head to license a complement phrase, with the result to be modified by an adjunct phrase. Schematically, this gives {{X YP} ZP} in an a-temporal syntax (with "{ }" marking nonlinear constituency, and with X, Y, Z as variables for syntactic categories). Translated into linear-order standard syntax, four possibilities arise, namely [ZP [X YP]], [ZP [YP X]], [[X YP] ZP], [[YP X] ZP]. Generally, for any structure with *n* binary-branching

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