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 proto-form, 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

nodes, there are 2^n linear orders. This can quickly lead to large numbers, but these are still smaller than the $m(!)$ possible permutations that would result from m constituents (for $m = 3$ as in the present example, this gives six).

The present proposal is that syntax does indeed provide only for the more modest constraints given by a-temporal syntax. A-temporal syntax is sufficient to specify a crucial ingredient of syntax, called structure-dependence in many of Chomsky's publications. Structure dependence is decidedly not the specification of linear order, but the specification of domination and sisterhood alone.

Order of constituents is only partially determined by structure dependence. The remaining task is that of phonology, semantics, and pragmatics combined. I have nothing to say about the latter two, but will assume that principles of information structure (such as "Agent First" and "Focus Last," *Foundations*, Ch. 8, sect. 8.7) are of primary importance here. Again, avoidance of duplication seems to make a syntactic determination of order superfluous at best in those cases in which other principles are at work already.

4. The role of phonology. As for linear order in phonology, it is indisputable that phonology (in contrast to syntax) needs linear order as a core concept. The string of phonemes /pit/ is in contrast with the string /tip/, while /ipt/ is a possible, but unrealized word in English, and any other permutation of the three phonemes is ill-formed in English. In other words, the elementary notions of contrast, distinctiveness, and well-formedness in phonology include linear order. Structuralist phonology used the term "syntagmatic relation" in this connection; here, "syntagmatic" literally means "in accordance with the time axis." Furthermore, a number of phonological rules are generally cast in terms of linear order. For example, the basic rule of compound stress in English or German says that the *first* of two parts in a compound carries main stress. For stress in phrases, the reverse holds (simplifying considerably): the *second* of two constituents in a phrase receives main stress. In other words, phonology is very much about the temporal line-up of chunks of speech. Given that it is grounded in the phonetics of speech, this does not come as a surprise.

Furthermore, some of the syntactic movement operations assumed in syntactic theory are clearly related, at least functionally, to either information structure (as in "topic first") or to preferred positions for constituents with either strong stress (focus positions) or weak stress (deaccentuation). Given that syntax is not conceived as "knowing" about nonsyntactic principles such as stress, it is almost inevitable to assign the respective movement operations to some other domain.

5. Where does order come from? If the present hypothesis about temporally unordered syntactic constituents should be correct, it would leave us with one crucial question: From what rules or principles does the actual order (encoded in phonological structures) derive? No complete answer can possibly be given here, but parts of the answer have been identified already: Jackendoff points out in several places that there are principles of ordering which are part of semantics, information structure in particular, and of phonology, heaviness constraints and stress preferences in particular.

Lexical information (either on individual items or on more or less extended lexical classes) must be another source of temporal order: Prepositions versus postpositions are an obvious example, prenominal versus postnominal adjectives might provide a further case.

Next, phonology itself provides ordering information, as we can see from principles, such as the one requiring long constituents to follow short ones (Behaghel's law).

Setting aside the cases just enumerated, there are substantial remaining problems. My formal proposal at this point is that the rules providing the interface between syntax and phonology – Jackendoff's "PS-SS interface rules" (Ch. 5, sect. 5.6) – provide the natural locus for stating the constraints on linear order for syntactic and/or semantic constituents. Such rules are, by necessity, sensitive to information stemming from both of the components between which they mediate. Here again, the architecture of

grammar proposed by Jackendoff provides a fruitful base for further research.

How did we get from there to here in the evolution of language?

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Abstract: Jackendoff's scenario of the evolution of language is a major contribution towards a more rigorous theory of the origins of language, because it is theoretically constrained by a testable theory of modern language. However, the theoretical constraints from evolutionary theory are not really recognized in his work. We hope that Jackendoff's lead will be followed by intensive cooperation between linguistic theorists and evolutionary modellers.

There has been a vigorous debate in the evolution of language literature on whether the human capacity for language evolved gradually or with an abrupt "big bang." One of the arguments in favor of the latter position has been that human language is an all or nothing phenomenon that is of no value when only part of its apparatus is in place. From a developmental perspective this has always been a peculiar argument, seemingly at odds with the gradual development of phonological, syntactic, and semantic skills of infants. In the context of the evolution of language, the argument was eloquently refuted in a seminal paper by Pinker and Bloom (1990). However, Pinker and Bloom did not go much further than stating that a gradual evolution of Universal Grammar was possible. They did not explore the consequences of such a view for linguistic theory, and their approach was criticized by both the orthodox generativists and the latter's long-term opponents.

Jackendoff (2002) has now gone one step further. If linguistic theory is incompatible with gradual evolution and development, perhaps linguistic theory needs to be revised. Jackendoff has written a powerful book around the thesis that the language capacity is a collection of skills ("a toolbox"). Some of these skills are language-specific, some not, and each of them is functional even without all or some of the other skills present. From his decomposition of linguistic skills follow a number of hypotheses on plausible intermediate stages in the evolution of language, that fit in neatly with many other theories, models, and findings in this field.

Jackendoff's book therefore presents a significant departure from the generative, "formalist" tradition, where the evolution of language has received little attention. In this tradition, the structure of human language has often been viewed as accidental rather than as adapted to the functions that language fulfills in life. Chomsky and others have been dismissive about attempts to reconstruct the evolution of language, which they regard as unscientific speculation. Chomsky famously observed that "we know very little about what happens when 10^{10} neurons are crammed into something the size of a basketball" (Chomsky 1975).

In contrast, Jackendoff presents the different tools from the "toolbox" as adaptations for better communication. Moreover, he gives a rather complete scenario of successive, incremental adaptations that is consistent with his view on how modern language works, and how it can be decomposed. Interestingly, he argues that present-day languages show "fossils" of each of the earlier stages: expressions and constructions that do not exploit the full combinatorial apparatus of modern language. Jackendoff's book is therefore a major contribution towards a more rigorous, scientific theory of the evolution of language, in part because it leads to some testable predictions, but more importantly because it is theoretically constrained by a testable theory of modern language.