agreement with the general objective and some of the main conclusions of the book, I call into question Jackendoff's account of the lexicon. My criticism will focus on three points, comparing the traditional account with the author's from a linguistic, a neuronal, and an architectural point of view. The comments are not intended as a rejection or a rebuttal of Jackendoff's proposal as a whole. Rather, the aim is to highlight certain points in the text where the author's attempt at overall integration results in loss of explanatory power within specific domains.

As Jackendoff himself acknowledges (p. 425), the most dramatic modification he brings to the linguistic architecture established in generative grammar concerns the function and content of the lexicon (Chs. 5 and 6). The usual distinction (e.g., Chomsky 1995), between rules as syntactic functions and lexical entries as tokens on which these functions operate, is blurred. In the new model, both types of entities are contained in the lexicon as triplets of phonological, syntactic, and semantic representations. The only difference between the lexical items and the l(exical)-rules is whether they contain typed variables: The former don't, the latter do.

The first problem with such an analysis is that Jackendoff does not provide enough linguistic evidence to ground it. His main argument is that even apparently fixed and memorized expressions, such as idioms and other semi-productive items, follow syntactic regularities, for example, the past tense of *take* in *take something for granted* is *took,* just as in any other case. Moreover, some of the semi-productive items even contain syntactic variables, as the noun phrase (NP) slot (*something*) in the previous example illustrates. Following the same logic, syntactic rules, that is, fully productive items, can be conceived of as structures with variable slots only, and can be included in the lexicon, just as set phrases or fixed idioms are included. While this lexicalist and representationalist approach might prove to be a good analysis of idioms, it certainly does not do justice to a wide range of phenomena syntactic research has been concerned within the last fifty years. As it stands, the model cannot handle derivational rules, for example, movement and constraints thereof, or purely structural-relational notions, such as c-command or government. How is one to account for the difference in grammaticality between the possible sentence *Who do you think will win*? and the complex NP violation **Who do you know [the fact that will win]* in Jackendoff's model? The description of the syntactic component and the two syntactic interfaces is not explicit enough to provide an answer. Since issues of this sort make up the bulk of syntactic research, this lacuna is not negligible. (Of course, this is not to say that representationalist or lexical accounts of syntax are in principle not possible. The question is, How much empirical material they are able to cover?)

Secondly, Jackendoff's proposal to conflate semi-productive and productive processes goes against neuropsychological findings. Pinker (1991; 1997) and Clahsen (1999) present convincing evidence that the mental dictionary and the mental grammar may be kept in different parts of the brain (Pinker 1997, p. 547). A double dissociation is found between lexically stored and rule-generated past tense forms in patients with specific brain lesions, and neuro-imaging studies also reveal a differential recruitment of brain areas. Although Jackendoff mentions some of these data, he has little to say about how to reconcile them with his fully lexicalized model.

Thirdly, the lexicalization of syntactic patterns is not without unwelcome consequences for the whole of the linguistic architecture. In the proposed model, lexical items and the l-rules have a double function; they act as interface conditions, but also provide material for the three generative components. In other words, the lexicon is constantly called upon during the derivation by the independent generative components, as well as the interfaces. Consequently, there is no clear-cut distinction between the subsystems of the grammar; the lexicon seems to have devoured the tripartite architecture. In his attempt to do away with syntactocentrism, Jackendoff seems to introduce heavy lexicocentrism in the design.

This architectural problem is especially acute when the model is extended to explain performance, that is, processing. "Now, when the lexicon is called, should we think of the processor calling the lexicon for a match? Or should we think of the lexicon, as part of the interface processor, as actively attempting to impose itself on the input? This perhaps awaits a better understanding of brain dynamics" (p. 207). Note that the two options make distinct empirical predictions about the relationship between the lexicon and the grammar or the mental processes underlying lexical access and retrieval. For example, one would expect lexical access to be a slower, two-step process in the first scenario (call to the lexicon plus word retrieval), whereas according to the second, access is immediate. Unfortunately, these predictions are not explored in detail, therefore the proposal is not comparable with existing accounts, which formulate empirically testable predictions (e.g., Levelt 1993).

In the foregoing discussion, I have been arguing that Jackendoff's reformulation of the status of the lexicon in the generative design of language lacks empirical support from linguistic, neuropsychological, and architectural viewpoint. As a consequence, more research is needed before Jackendoff's framework can be evaluated against rival theories of the language faculty. Although unification is a welcome development in the history of sciences, and the cognitive domain should be no exception, as Jackendoff convincingly argues, we have to make sure that we are not paying too high a price for it.

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Language shares neural prerequisites with non-verbal capacities

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Abstract: Based on neuropsychological evidence of nonverbal impairment accompanying aphasia, I propose that the neural prerequisites for language acquisition are shared with a range of nonverbal capacities. Their commonality concerns the ability to recognize a limited number of finite elements in manifold perceptual entities and to combine them for constructing manifold entities.

Although the brain figures prominently in the title of the book *Foundations of Language: Brain, Meaning, Grammar, Evolution* (Jackendoff 2002), little attention is devoted to the available empirical evidence on the neural substrate of linguistic competence. One of the most robust facts in neuropsychology is the cerebral asymmetry of the neural substrate of language. In the great majority of people, left brain damage (LBD) causes aphasia, but neither does aphasia affect all aspects of language nor is it the only sequel of LBD.

Aphasia affects syntax, phonology, and semantics, which can all be conceptualized as being based on combinatorial systems of finite elements. Other components of verbal communication cannot easily be reduced to combinations of finite elements because they demand fine-grained distinctions within distinct elements or categories. Such components, like emotional prosody or the pragmatics of communicative exchange, are relatively spared in aphasia but vulnerable to diffuse or right-sided brain lesions, which do not cause aphasia (McDonald 1993; Starkstein et al. 1994).

At the same time, most aphasic patients have difficulties with nonverbal tasks that require the extraction of a limited number of finite elements from a rich perceptual diversity. Such tasks are, for example, color sorting where colors have to be sorted according to

categories rather than to perceptual similarity (e.g., light green may be perceptually closer to yellow than to dark green but has to be sorted with the greens); or matching objects by type rather than perceptual appearance, as for example when an analogue clock has to be matched with a digital clock rather than a (visually more similar) compass; or matching images of objects with their characteristic sound (Vignolo 1990). By contrast, matching tasks that require consideration of variations within a category such as, for example, matching of individual faces, do not crucially depend on left hemisphere integrity (Benton & Van Allen 1968).

There are symptoms of LBD, which on first sight, do not fit into a left-hemisphere dominance for extraction and combination of finite elements. These are "high level" disorders of motor control traditionally termed "apraxia." These symptoms have led to the proposal that left-hemisphere dominance concerns primarily motor control. Attempts to deduce language dominance from motor dominance have either emphasized the motor demands of speaking (Kimura 1983) or postulated that language evolved from gestural communication (Corballis 2002). Recent research suggests that apraxia has more to do with the application of combinatorial systems of finite elements than with motor control. Apraxia affects three domains of actions: imitation of gestures, performance of meaningful gestures on command, and use of tools and objects. Evidence has been provided that LBD patients fail imitation of novel gestures because they cannot reduce them to combinations of a limited number of defined body parts (Goldenberg 1996; Goldenberg & Strauss 2002). They have similar problems when this body part coding is required to match photographed gestures (Goldenberg 1999) or to replicate gestures on a mannequin (Goldenberg 1995), although motor control is trivial for pointing to photographs and very different from imitation for manipulating a mannequin. By contrast, the exclusive role of LBD is mitigated or vanishes completely when imitation puts fewer demands on body-part coding and requires instead fine-grained distinctions within one category of body parts (e.g., the fingers of one hand). Performance of meaningful gestures to command is frequently tested by asking for a pantomime of object use (e.g., "Show me how you would use a toothbrush"). Here the crucial difficulty of LBD patients seems to concern the demonstration of the object and its use by selecting distinctive features of the motor action associated with that use (Goldenberg et al. 2003). Use of tools and objects poses demands on many cognitive functions and can be impaired by brain lesions in many locations (Schwartz et al. 1999), but one component which is exclusively bound to left hemisphere integrity is the inference of possible functions from structural properties of objects. For example, LBD patients may fail to discover that a hook can be fixed to a ring by inserting it (Goldenberg & Hagmann 1998). Such failures can be attributed to an inability to detect a limited number of functionally relevant features and to solve mechanical problems by reducing them to basic functional relationships.

There is controversy concerning whether the co-occurrence of these difficulties with aphasia in LBD patients is a result of similarities between the affected functions or of anatomical contiguity between their neural substrates, but this opposition may be ill-conceived. Anatomical contiguity is unlikely to have arisen from arbitrary placement of unrelated functions. Presumably it reflects a deeper affinity of their neural substrate. It may be more fruitful to ask for the functional properties corresponding to this neural commonality. I propose that this commonality is to be sought in the ability to recognize a limited number of finite elements in manifold perceptual entities, and to combine them for reconstructing manifold entities. In this account, the neurally designed predisposition for language acquisition is not specific for language but also supports a range of nonverbal capacities.

Jackendoff's conceptualism

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Abstract: In this commentary, I concentrate upon Ray Jackendoff's view of the proper foundations for semantics within the context of generative grammar. Jackendoff (2002) favors a form of internalism that he calls "conceptualism." I argue that a retreat from realism to conceptualism is not only unwarranted, but even self-defeating, in that the issues that prompt his view will inevitably reappear if the latter is adopted.

In *Foundations of Language: Brain, Meaning, Grammar, Evolution* (henceforth *Foundations*), Jackendoff is sympathetic – more sympathetic than I, for one, would have expected him to be – to the view that the theory of meaning in empirical linguistics should link language to human action and communication, and that the notions of reference and truth are indispensable both as explaining relations of sentences to one another, as in implication, and their relations to their subject matter and conditions on their use. Jackendoff holds, however, that the proper implementation of this view requires the adoption of a variety of irrealism about what we refer to, and what makes what we say true or false. In Part III of *Foundations* he offers a variety of reasons for this irrealism, or conceptualism, as he calls it. None of these seem to me effective; I will consider a few below. More than this, however: Jackendoff's irrealism threatens to be self-defeating, in that the problems that he discerns for realist accounts are bound to return, in just the same form, under the interpretation of reference that he offers.

Having remarked, in my view rightly, that the signal contribution of generative grammar was to take for the subject of linguistics not the formal properties of language but rather the basis for human knowledge and capacity for language, Jackendoff is wary (to the point of abhorrence) of saying that languages themselves are abstract objects whose properties we know (or "cognize," to use Chomsky's suggestion of a more neutral terminology). He is wary of this, not because he rejects the notion of implicit or tacit knowledge, but rather because he thinks that, once we say that languages are abstract, we have cut ourselves off from the psychological investigation that is to be the core of the enterprise (p. 297). He is also repelled (p. 299) by the idea that these abstract objects have always been lying around, waiting for people to "grasp" them. Abstract objects in general, he thinks, must be "human creations."

The conflicts here are illusory, however. What comes to hold only through human organization and activity is not the existence of abstract objects, but empirical identities: That language *L* has property *P,* may be a fact on a par with the truths of arithmetic; but that Higginbotham's language or Jackendoff's language = *L,* and therefore that Higginbotham's language or Jackendoff's language has property *P,* is a psychological contingency, to which all the available evidence, about them and other humans, is relevant. I suppose we may agree that a primitive mechanism of "grasping" is, if true, a counsel of despair. But how is the slogan that abstract objects are "human creations" supposed to help? Everyone knows on a moment's reflection that to enclose the largest area with a piece of string, you should form it into a circle. Supposing that circles are human creations brings us no closer to an explanation of why this should be so.

Jackendoff opposes what he calls common-sense realism about reference – according to which (simplifying only a bit) words refer to things – to his own conceptualist account, according to which speakers judge words to refer to things in "the world as conceptualized" by them. The basis for the substitution of the conceptualist view for the standard one is a variety of questions about reference given in Chapter 10, section 3, (pp. 300–303). All our old friends are there: Sherlock Holmes, the unicorn in my dream, the value of my watch, virtual squares, "politically constructed entities" such as Wyoming, and so forth. There is no space here to consider all of these, but I make two remarks.