choices of VMPFC patients might reflect a lack of pro-social feelings.

References

1 Greene, J.D. (2007) Why are VMPFC patients more utilitarian? A dual-process theory of moral judgment explains. *Trends Cogn. Sci.* 11, 322–323
2 Koenigs, M. and Tranel, D. (2007) Irrational economic decision-making after ventromedial prefrontal damage: evidence from the Ultimatum Game. *J. Neurosci.* 27, 951–956
3 Koenigs, M. *et al.* (2007) Damage to the prefrontal cortex increases utilitarian moral judgements. *Nature* 446, 908–911
4 Moll, J. *et al.* (2007) The cognitive neuroscience of moral emotions. In *Moral Psychology* (Vol. 3) (*Morals and the Brain*), (Sinnott-Armstrong, W., ed.), MIT Press (in press)
5 Moll, J. *et al.* (2007) The self as a moral agent: linking the neural bases of social agency and moral sensitivity. *Social Neurosci.*, DOI: 10.1080/17470910701392024
6 Allman, J.A. *et al.* (2002) Two phylogenetic specializations in the human brain. *Neuroscientist* 8, 335–346
7 Ochsner, K.N. *et al.* (2004) For better or for worse: neural systems supporting the cognitive down- and up-regulation of negative emotion. *NeuroImage* 23, 483–499
8 Greene, J.D. *et al.* (2004) The neural bases of cognitive conflict and control in moral judgment. *Neuron* 44, 389–400
9 Greene, J.D. *et al.* (2001) An fMRI investigation of emotional engagement in moral judgment. *Science* 293, 2105–2108

| Book Review

Two views of simplicity in linguistic theory: which connects better with cognitive science?

Simpler Syntax by Peter W. Culicover and Ray Jackendoff, Oxford University Press, 2005. £23.99/US$42.00 pbk (608 pages) ISBN 0-19-927109-7

Linguistic Minimalism: Origins, Concepts, Methods and Aims by Cedric Boeckx, Oxford University Press, 2006. £17.99/US$35.00 pbk (246 pages) ISBN 0-19-929758-4

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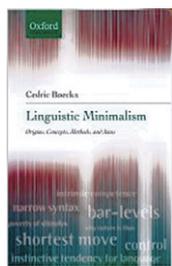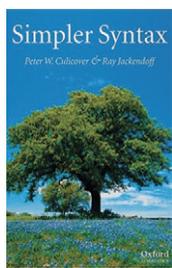
Two recent books encapsulate two influential recent theoretical developments in syntax. Both take simplicity as their starting point but in radically contrasting ways, and with dramatically different results. Peter Culicover and Ray Jackendoff's *Simpler Syntax* aims to make syntactic representations as simple as possible. Cedric Boeckx's *Linguistic Minimalism* investigates the attempt to minimize the complexity of the principles of syntax, as proposed by Chomsky in the mid-1990s. Both books set out research programs rather than finished 'theories' of syntax. But their different interpretations of simplicity lead to different perspectives on syntax, its relationship to semantics, and to the cognitive and biological foundations of language. The question, for this review, is: how do these contrasting theoretical programs mesh with the broader cognitive science of language?

Culicover and Jackendoff's *Simpler Syntax* hypothesis proposes striking a retreat from the increasingly complex and abstract syntactic representations emerging from the past four decades' research on generative grammar. They suggest that syntactic theory should postulate the mini-

mum structure necessary to mediate between phonology and meaning. And the result is simple indeed: a theory involving simple phrase structure trees, with well-known labels (e.g. Det, N and NP), which look delightfully familiar to the computational linguist or psycholinguist. Culicover and Jackendoff argue that the apparent complexity of syntax arises because of its intricate interactions with phonology and semantics.

Culicover and Jackendoff emphasize the idiosyncrasy and complexity of language – focussing on issues that generative grammarians have often ignored as the linguistic 'periphery'. Indeed, Culicover [1] has previously argued that lexical items cannot be grouped into a small number of sharply defined syntactic categories because each item has its own distinctive syntactic properties. Similar to Construction Grammar approaches (e.g. Ref. [2]), Culicover and Jackendoff suggest that there is no sharp distinction between lexicon and grammar. However, they still advocate the autonomy of syntax in certain cases involving constituency and/or ordering of syntactic elements (e.g. initial or final V in VPs) – enough, they argue, to mediate the relationship between semantics and phonology.

The real power of the *Simpler Syntax* approach is illustrated by a series of detailed and tightly argued reappraisals of classic linguistic phenomena, from binding and control, to ellipsis and island constraints. In each case, they argue that the complexity of an apparently syntactic process in reality arises from the interaction of syntax and semantics. They illustrate how, by studying the syntax–

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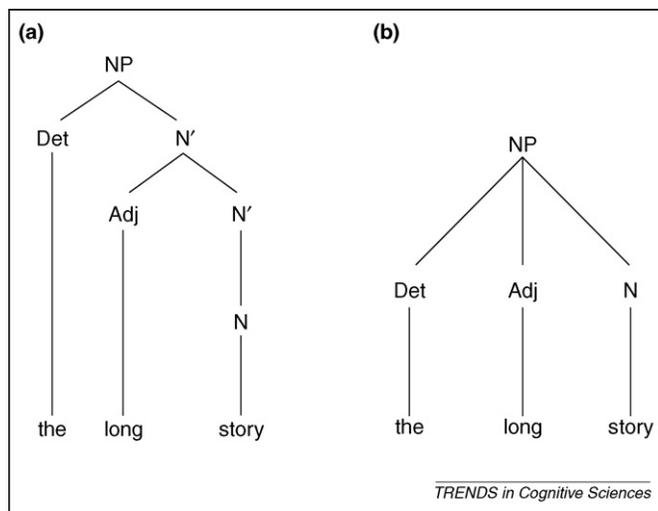
Figure 1. The long story. **(a)** Nested structure. **(b)** Flat structure. Abbreviations: Adj, adjective; Det, determiner; N, noun; N′, this is a technical notion from linguistic theory, specifically X-bar syntax; NP, noun phrase.

semantics relation more closely, the intricacies of the phenomenon can be, at least partially, unravelled, without elaborating their bare syntactic machinery.

One of many elegant discussions concerns pronoun binding. Seeing John carelessly cropping one of his holiday snaps, it's natural to say:

Look, John's just cut himself in half. (1)

In (1), the reflexive pronoun himself does not co-refer with John, as mandated by standard binding theory, one of the core principles of standard generative grammar [3]. Instead, it binds to a representation of John. The syntactic legitimacy of such uses has, Culicover and Jackendoff argue, a transparently semantic origin – although they argue that a purely semantic or pragmatic analysis, which ignores syntactic structure, cannot work. Thus, what matters is the interface between syntax and semantics.

Culicover and Jackendoff's framework should be of interest to the wider cognitive science community. Syntactic analyses are straightforward; the approach is constraint-based, exploiting rich interconnections between phonology, syntax and semantics (discussed extensively in [4]) to better fit with the apparently rich interactions between these sources in processing and acquisition. Moreover, their simple syntactic analysis might have immediate implications for acquisition. An influential recent nativist argument [5] asks, rhetorically, how could children possibly know, from the available input, that, for example, *the long story* has the nested structure (Figure 1a) rather than the flat structure (Figure 1b)?

Simpler syntax could offer a way out of this puzzle. The child does not need innate knowledge to reject the flat structure (Figure 1b) because it is the syntactically correct analysis.

However, this type of 'relaxed' theoretical framework might seem difficult to reconcile with strong claims about language universals. Culicover and Jackendoff suggest that languages draw on a universal 'toolbox' of language-specific mechanisms encoded in an innate Universal Grammar, but that each language uses different subsets of tools. But this raises a puzzle: why evolve 'tools' that are not used in the present linguistic environment? This appears to require uncanny, and perhaps implausible, evolutionary foresight.

Boeckx's *Linguistic Minimalism* has a different flavor. The program takes the broad structure of linguistic theory to be already established, and enunciated in the 'Principles and Parameters' approach [3] (although Culicover and Jackendoff might disagree). Minimalism aims to provide a reconstruction of this account, using a few deep principles – that are presumed to arise from the assumption that language is 'perfectly' designed to relate sound and meaning. What the criteria for such perfection are has not yet been fully defined – but the hope is that language will follow from 'our best guesses regarding conceptual, biological, physical necessity' (Boeckx, p. 4). Yet the aim of keeping principles simple has spectacularly inflationary implications for syntactic structure, contrasting starkly with *Simpler Syntax*. Boeckx comments approvingly (p. 53) that 'many linguists…believe that simple declarative sentences consist of about fifty phrases, all embedded inside one another'. The implications of such complexity for theories of parsing, production and the incremental construction of meaning are alarming.

One might wonder how much direct contact with linguistic judgments, let alone psycholinguistic or neuroscientific data, might be possible from a minimalist perspective. But where the account does contact the data, one wonders how strong the connection really is. Boeckx notes that '…it is now a well-established fact that if you try to front an element X of type Y to a position Z, you cannot do this if there is an element W of type Y that is in between X and Z. This is the basic idea behind Rizzi's *Relativized Minimality* principle and of Chomsky and Lasnik's variant in terms of Shortest Move. If a Nobel Prize in linguistics existed, I think Rizzi's insight ought to be rewarded with it' (Boeckx, 2006, p. 103). Rizzi's [6] insight, now incorporated into mainstream minimalism, is, Boeckx says, exemplified in the contrast:

The boy was given the toy. (Compare with: (2)
somebody gave the boy the toy)
The toy was given the boy. (3)

Crucially, (3) is presumed to be ungrammatical. Yet this structure is acceptable in UK English. Indeed, the celebrated British grammarian Quirk (p. 214 in Ref. [7]) directly discusses grammatical sentences such as:

A book was given the boy by the man (4)

This observation concerning variation between dialects seems ominous for any fundamental and putatively universal linguistic constraint.

Minimalists might not be particularly concerned about such details. Minimalism is aiming for deep underlying regularities in the grammatical 'core'. Irregularity and inelegance is presumed to reside in the linguistic periphery and can be set aside. By contrast, Culicover and Jackendoff argue that the ragged 'periphery' contains the essence of language; whatever linguistic devices, processing mechanisms and acquisition strategies are required to deal with the periphery, where language is irregular and idiosyncratic, should suffice to deal with any residual core. A

cognitive science of language might do better to go in the direction of simpler syntax (or Construction Grammar proper), and accept the imperfection and complexity of linguistic structure, and to leave the minimalist program to specialists interested in the internal structure of linguistic theory.

References

1 Culicover, P.W. (1999) *Syntactic Nuts,* Oxford University Press
2 Goldberg, A.E. (2006) *Constructions at Work: The Nature of Generalization in Language,* Oxford University Press
3 Chomsky, N. (1981) *Lectures on Government and Binding,* Foris
4 Jackendoff, R. (2002) *Foundations of Language,* Oxford University Press
5 Lidz, J. *et al.* (2003) What infants know about syntax but couldn't have learned: experimental evidence for syntactic structure at 18 months. *Cognition* 89, B65–B73
6 Rizzi, L. (1990) *Relativized Minimality,* MIT Press
7 Quirk, R. (1965) Descriptive statement and serial relationship. *Language* 41, 205–217