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2   **Book Review**

3   Cedric Boeckx, *Reflections on language evolution: from minimalism to pluralism* (Conceptual
4   Foundations of Language Science 6). Berlin: Language Science Press, 2021, 76pp., $20.00
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12   In *Reflections on Language Evolution* (ROLE), Cedric Boeckx aims to focus on "Darwin's
13   problem", or the problem of how human language evolved. His central aim is to show how
14   natural language syntax may have evolved gradually, not suddenly. Framing his discussion,
15   he notes that the study of language is in an important sense inevitably an issue for the
16   humanities. Since the modern cognitive revolution, linguists have placed increasing emphasis
17   on the biological foundations of language, but linguistics is a scientific enterprise wedded to
18   humanistic concerns much more intimately than many other issues of biological evolution.
19   ROLE continues Boeckx's recent transition away from generative grammar and towards what
20   he considers to be "pluralism". Boeckx's framing carries with it the implication that the
21   minimalist program is in crucial respects incompatible with inter-disciplinary perspectives.
22   What follows are summaries of ROLE's major arguments and a number of critical evaluations
23   of its claims.

24   To properly address language evolution, Boeckx argues that we need to boil down the bare
25   essentials of linguistics into a format approachable, interpretable and useable by other fields.
26   Otherwise, concepts from linguistics "won't get past customs" (3). Boeckx rhetorically places
27   more emphasis on empirical discoveries than conceptual argumentation with respect to
28   Darwin's problem. "You can't investigate it in the privacy of your linguistics office", he notes
29   (2). Some linguists have alternatively argued that, somewhat paradoxically, due to the very
30   limited direct empirical evidence about human language evolution, perhaps the armchair may
31   not be so limiting. Evolutionary scenarios must be falsifiable, and concordant with reasonable
32   interpretations of existing evidence. But the evolutionary scenarios themselves cannot be
33   detected via empirical observation. Boeckx takes up this challenge in the following manner.

34 The research program that ROLE seems most sympathetic to appears to be the work of Simon

35 Kirby and collaborators. The *iterated learning paradigm* examines artificial grammar

36 processing to unearth generic biases that drive the learning process. Boeckx notes that "critics

37 are quick to point out that this line of work implements the cognitive biases by brute force, and

38 does not show how these evolve organically, as must have happened in the course of

39 (biological) evolution" (28). He deems this line of criticism "unfair" – yet perhaps not inaccurate.

40 Boeckx's overall preference is to think of language as "a collection of (generic) cognitive

41 biases" (29). He does not provide much discussion of what these biases are, and how they

42 can account for natural language syntax: "I suspect there are likely to be very many,

43 associated with general notions like memory, attention, salience, etc" (29). It is surely

44 reasonable to try and cash out as much of language as we can using generic biases, but

45 ROLE would be more convincing if some examples were provided to the reader of how these

46 accounts are superior. For instance, ROLE provides no motivations for why any specific

47 minimalist analysis of linguistic phenomena should be rejected, which until recently he appears

48 to have endorsed (Murphy 2015). Boeckx seems to agree with generativists on the uniqueness

49 of the core trait (unbounded hierarchical recursion) and its possible mechanism

50 (Merge/labeling), but throughout ROLE he engages in discussions that imply that he has some

51 alternative explanation at hand, that never quite materializes.

52 Boeckx argues that aspects of language that can more readily be compared with non-human

53 cognitive faculties are ripe for evolutionary study. That is, components of language "that don't

54 manipulate (parts of) sentences" and are fundamentally lower-level computations seem

55 "ideally suited for fruitful comparisons" with other species (3). Boeckx's previous book was

56 entitled *Elementary Syntactic Structures* (Boeckx 2014), a reference to Chomsky (1957). His

57 new book is a reference to Chomsky (1975), *Reflections on Language*, adding *Evolution* to

58 the title. We might expect that his next book will explore *Paleoanthropological Aspects of the*

59 *Theory of Syntax*, although Boeckx never explicitly renounces his earlier minimalist work – but

60 it seems implicit. The reader of ROLE would benefit if Boeckx clearly spelled out which aspects

61 of his previous work we should consider part of his current thinking, and which parts should

62 be left aside. For instance, Boeckx claims that binary set-formation/Merge is an appropriate

63 way to frame "core" language, but at the same time seems to think that it is not relevant for

64 evolutionary investigations. He notes that "[w]hat's clear in the context of Darwin's Problem is

65 that language is not a thing. It is many things put together: it's a mosaic, a patchwork, a

66 complex system". These types of statements occur throughout the book, and it is unclear what

67 their explanatory value is. What does it mean to say that language "is not a thing"?

68 Boeckx "takes the language faculty to be akin to an exocentric compound: all parts are needed

69 to make a unique whole, but none of the parts, on their own, are unique" (4). The impression

70 that the reader gets is that because treating language as a constellation of domain-general

71 processes is more amenable for gradualist evolutionary researchers, then linguists should

72 think of language in this manner. This constitutes an unusual methodology: If X is *easier* to

73 study via framework P than via framework Q, then assume that the internal nature of X

74 concords with the predictions of P. There are many reasons to doubt ROLE's gradualist

75 perspective, including the observation that Merge seems to have remained unemcumbered

76 and stable (i.e., there are not different kinds of recursion across languages), which suggests

77 that it is a recent trait and not subject to many evolutionary pressures. Merge is clearly not

78 different in signed languages, and so issues pertaining of the gradual linking of sensorimotor

79 apparatus to Merge do not appear to be relevant, at least with respect to the intial emergence

80 of narrow syntax.

81 Another major thesis in ROLE concerns Boeckx's effort to show that the language

82 change/evolution dichotomy should be dispelled. He presents the following example:

83 Domesticated finches produce songs of greater complexity than wild white-rumped munias.

84 Boeckx asks: "If we were to refer to these song repertoires as 'languages', would we treat the

85 change in song structure from the munia to the finch as a case of language evolution or

86 language change? That there are genetic differences between the wild munia and the

87 domesticated Bengalese finch would maybe lead one to talk about language evolution,

88 although the core song circuit of the Bengalese finch does not differ in fundamental ways from

89 that of the munia" (30). It is unclear how this demonstrates that the language change/evolution

90 distinction is invalid. It seems in line with the claim that human (self-)domestication likely ran

91 alongside an increasing computational complexity of language, but just as how "the core

92 circuit" of the finch does not differ substantially from that of the munia, presumably this also

93 applies between early and modern *homo sapiens*. Early *homo sapiens* may have had the

94 *capacity* to compute multiple *wh*-dependencies and crossing grammatical relations. All we can

95 conclude is that domestication triggered certain latent computational capacities, but this does

96 not alter the valid description of Modern English as exhibiting 'language change' relative to

97 Old English, but not language evolution. Be it wild or domesticated, birdsong still adheres to

98 linear order – something that natural language syntax is independent of.

99 Boeckx later claims that "it is now possible to move beyond claims that language is exclusive

100 to us, and that careful experimental testing can be carried out" (33). This again seems to

101 conflict with his assessment at the beginning of ROLE that "core" parts of language may

102 indeed be unique to humans. Even if its sub-components are found across the animal

103 kingdom, the unique assembly of computational capacities (and representations) is

104 demonstrably a species-defining trait.

105 ROLE reviews some recent comparative research, "from birds to bats to baboons", aiming to
106 show that many features of the faculty of language (broadly construed) can be found in non-
107 humans. Counter-claims (i.e., that birds cannot compute long-distance and hierarchically
108 organized filler-gap dependencies, or that baboons are not sensitive to subjacency) are
109 termed "tedious" by Boeckx (7). He notes: "I do not find this [language change/evolution]
110 dichotomy particularly useful, and believe that a continuum of cognitive biases that interact
111 with changing communicative conditions from which language-readiness emerges, shaping
112 the range of grammars acquired, is a more adequate stance."

113 This talk of "continuums" and "spectrums" and the like is, of course, vogue and intuitive, but
114 ROLE does not offer a convincing rebuttal to the more traditional, simplistic assumption that
115 there is something human-specific about natural language syntax that may or may not be
116 composed of a constellation of generic neural processes, but which nevertheless seems to
117 have emerged relatively suddenly.

118 The above is reflective of a more general move that Boeckx executes throughout ROLE: When
119 he is faced with a direct conceptual obstacle or possible rebuttal, he appears to deny that the
120 opposing camp even exists. He uses this to dismiss (and not engage or negotiate with)
121 numerous forms of criticism: Narrow vs. Broad faculty of language? An illusion. Language
122 change vs. language evolution? A tedious, mainstream false dichotomy. Yet, readers of ROLE
123 are never presented with convincing arguments against these apparently illusory constructs –
124 they are simply stipulated as "tedious" or not "particularly useful".

125 ROLE also contains some unmotivated claims about the Minimalist Program. Boeckx claims
126 that the Minimalist Program has come to an end – that "the program as a whole may indeed
127 have been (at best) premature". The goal of positing as few language-specific architectural
128 and computational foundations as possible seems to be something that Boeckx endorses
129 throughout his book, and yet he distances himself from the minimalist account of evolution,
130 which "must be wrong", he states, providing us only "very briefly" with his reason: "[I]t is wrong
131 because it disregards the comparative evidence ('only us'), it fails to appreciate the multi-level
132 approach required to link genotype and phenotype (claiming that a single mutation yields the
133 simple, atomic operation "merge"), it keeps the discussion at the logical level, without
134 attempting to even sketch a plausible path to testing it, and does not engage with the many
135 lessons coming from the great discoveries in paleo-sciences over the past decade" (9).

136 Since this is the core of ROLE's critique, these arguments will be assessed one by one.

137 Consider first the claim that the most prominent minimalist model of evolution (crucially, not
138 the only one) "is wrong because it disregards the comparative evidence". There is no
139 comparative evidence to consult with respect to the major components of narrow syntax; the

140 argument is a straw man. Boeckx disapproves of the rather Old Testament-style and perhaps

141 even, in the current climate, somewhat reactionary belief that non-human animals "are non-

142 linguistic creatures" (10), yet nowhere does he provide any reasons to assume otherwise.

143 What about the claim that minimalism "fails to appreciate the multi-level approach required to

144 link genotype and phenotype"? The "single mutation" model is not incompatible with a "multi-

145 level" approach; that is, if linguists acknowledge that genes do not code for "the labeling

146 algorithm" or "head movement". A "single mutation" account would still, of course, require a

147 series of linking hypotheses connecting genes to epigenetic modification (epigenome),

148 signalling pathways (organome), codes for development and assembly (toponome), neural

149 populations and brain areas (cytome), neural wiring (connectome), neural inter-areal activity

150 (dynome), and all the way up to linguistic computations (cognome), stepping over some other

151 important levels of organization and complexity. Boeckx does not deny this explicitly. Binary

152 set-formation is a discrete computation – there are no "multi-level" stages to it. You either have

153 Merge or you don't (Berwick & Chomsky 2019). As biologists such as John Maynard Smith

154 and Eörs Szathmáry have shown, major evolutionary transitions are assuredly possible, with

155 the idea that a small neural rewiring yielded a consequent dramatic computational expansion

156 not being unreasonable, as Richard Dawkins (2015: 382) has noted.

157 What Boeckx finds most compelling about generative linguistics is the earliest results

158 pertaining to the Chomsky hierarchy, the necessity to posit forms of nested and crossing

159 dependencies, and the consensus that "natural languages are both strongly and weakly mildly

160 context-sensitive" (14). Is Boeckx therefore wholly against the idea that human beings have

161 some species-unique properties? Apparently not quite. Though he dismisses language as a

162 candidate, he instead argues that "brain changes giving rise to our globular skull, use of

163 complex symbiotic tools like the bow and arrow, and some aspects of figurative art are fairly

164 good bets in my current opinion" (10) for constituting species-unique attributes. It seems we

165 are to believe that what distinguished Robin Hood from the animals of Sherwood Forest was

166 not his knowledge of language, but rather his archery skills. More worryingly, the Chomsky

167 hierarchy makes reference to linearity and concatenation, yet as Berwick and Chomsky (2019)

168 note: "Merge-based systems do not even appear in the hierarchy, and anything concluded

169 from the study of the Chomsky hierarchy is totally irrelevant to the evolution of Merge-based

170 systems".

171 Boeckx then claims that "[e]volutionary considerations invalidate certain theoretical

172 frameworks that fail to come to grips with the 'complex dynamical system' nature of language".

173 Why is a Merge-based computational system that is optimized for efficient structure-building,

174 and that emerged discretely and relatively rapidly in evolutionary time, incompatible with being

175   embedded inside a broader scientific framework capable of modelling a "complex dynamical
176   system"? There is no clear reason, and Boeckx provides none.

177   Boeckx seems right to note that "phenotypic novelty is largely reorganizational", and that
178   "novelty arises from the combination of generic mechanisms, whose collective effects give rise
179   to what appears to be *de novo* characters". Crucially, however, the narrow faculty of language
180   can still be a coherent concept even if it is ultimately assembled via wholly generic sub-
181   systems of neural computation (as argued in Murphy 2020). What is claimed to be "narrow"
182   and species-unique is the computational capacity. Minimalist syntacticians are not necessarily
183   tied to the idea that human syntax cannot be assembled via a multitude of domain-general
184   components. More generally, we should recall that the very notion of *species-unique* traits is
185   far from unusual. These are, of course, necessary even to demarcate distinct species, as is
186   commonly done, yet for Boeckx the human capacity for language is not a clear enough
187   demarcation. This may seem trivial to some readers, but recall that even in the late nineteenth
188   and early twentieth centuries the idea that language constituted a species-distinct phenotype
189   was not widely entertained.

190   There is also something of a tension in ROLE between Boeckx's insistence that we should
191   boil down language sufficiently so as to render it potentially commensurable with neurobiology,
192   and his parallel insistence that we should doubt "narratives focused on 'component parts', like
193   Berwick and Chomsky's about a syntactic operation like 'Merge' being *the* basic property that
194   adds content to FLN" (20, emphasis his). It is quite difficult to imagine a language faculty
195   without Merge. It is surely a major "component part". There are many potential, and exciting
196   ways to ground Merge in neurobiology and evolution, which Boeckx does not cite or discuss,
197   and which seemingly render his thesis more problematic.

198   As a means of laying out an alternative framework, Boeckx first discusses the "phonological
199   continuity" hypothesis, or the well-established claim that "phonological processes can be
200   captured by finite-state machinery" (20) and are deeply grounded evolutionarily. The flip side
201   of this argument is that natural language syntax exhibits *discontinuity*, with humans exhibiting
202   either a categorically distinct computational machinery, or a considerably higher propensity to
203   construct hierarchical tree-structures. In contrast, Boeckx tries to argue that syntax and
204   phonology "exhibit a higher degree of continuity" than typically assumed (21). In defence of
205   his claim, Boeckx cites Thomas Graf's work showing that when we consider syntax as
206   involving computations over sets of trees, and not strings, then a finite-state automaton can
207   suffice. Yet Boeckx omits a crucial detail: While the computational machinery may be similar
208   (a positive step towards the minimalist approach, we might add), the level of featural
209   complexity between the atoms of phonology and the atoms of syntax-semantics differ in major

ways. So there remains much discontinuity for syntax – and ultimately, so long as there remains *any* discontinuity (no matter how small) then the discontinuity hypothesis remains intact. What's more, Boeckx sidesteps a major presupposition of his thesis, that syntax exploits sets, not strings. This remarkable fact about syntax, and its potential origins, conceptual format and neurobiological basis, is not touched upon in ROLE. Boeckx briefly conjectures about hierarchical tree-structures: "I think [these] predated the emergence of *sapiens*" (23). No elaboration is provided.

ROLE emphasizes that interdisciplinary work typically benefits all fields involved, and that linguists should venture into neighboring domains, allowing linguistics to return to an original goal of generative grammar of using language not simply to explore technical issues of the English tense system, but to use it as a window into the human condition. Yet, throughout the text we are provided with critical comments about generative grammar that are often inaccurate. Boeckx says: "Over the years, talk of optimization, efficiency, etc., which occupied center stage in the early days of the program, has been replaced by a focus on evolutionary considerations. If such considerations lead to an impasse, the program as a whole may indeed have been (at best) premature" (9). However, "talk of optimization" is very much still at the heart of current minimalist thinking. Pitting "efficiency" considerations *against* "evolutionary considerations" is also not accurately reflective of current discussion. Both of these considerations have often complemented each other, but are also discussed in the literature in wholly independent terms. Boeckx later concludes that if linguists developed biologically plausible models, then "there would be a lot less [discussion] about physical laws in language design" (41).

ROLE provides no reason why minimalist discussions of optimized computational machinery is incompatible with biology. Conversely, nor are we told why Boeckx's gradualist account of the evolution of syntax can have no place for such concerns of computational efficiency. We are also given no concrete rebuttal of earlier ideas espoused by Boeckx. There is a clear discontinuity between Boeckx's earlier writings and his current position in ROLE, but little clarity with respect to which pieces we are supposed to pick up, and which pieces we are supposed to leave behind.

References

Berwick, R.C., & Chomsky, N. (2019). All or nothing: No half-Merge and the evolution of syntax. *PLoS Biology* 17(11): e3000539.

243 Boeckx, C. (2014). *Elementary Syntactic Structures: Prospects of a Feature-Free Syntax*.
244 Cambridge: Cambridge University Press.

245 Chomsky, N. (1957). *Syntactic Structures*. The Hague: Mouton.

246 Chomsky, N. (1975). *Reflections on Language*. New York: Random House.

247 Dawkins, R. (2015). *Brief Candle in the Dark: My Life in Science*. London: Ecco.

248 Murphy, E. (2015). Book review: Elementary Syntactic Structures: Prospects of a feature-free
249 syntax. *Journal of Linguistics* 51(3): 682–685.

250 Murphy, E. (2020). *The Oscillatory Nature of Language*. Cambridge: Cambridge University
251 Press.