Buzzsaws and blueprints: Commentary*

HELEN GOODLUCK

Department of Linguistics, University of Ottawa

The review article by Sabbagh & Gelman (S & G) on *The emergence of language* (EL) mentions several criticisms of strong emergentism, the view that language emerges through an interaction between domain-general learning mechanisms and the environment, without crediting the organism with innate knowledge of domain-specific rules, a view that successful connectionist modelling is taken to support. One criticism of this view and the support for it that connectionist modelling putatively provides has been made frequently, and is noted by S & G: it is arguable that connectionist simulations work only because the input to the network in effect contains a representation of the knowledge that the net seeks to acquire. I think it is worth adding to this another criticism that to my mind is a fundamental one, but which has not featured so strongly in critiques of connectionism. A primary goal of modern linguistics has been to account not merely for what patterns we do see in human languages, but for those that we do not. The concept of Universal Grammar is precisely a set of limitations on what constitutes a possible human language. The kind of example used in teaching Linguistics 101 is the fact that patterns of grammaticality are structurally, not linearly, determined: in English we form a *yes–no* question by inverting the subject NP and auxiliary verb, not by inverting the first and second words of the equivalent declarative sentence, or the first and fifth words, or any number of conceivable non-structural operations. Could a connectionist mechanism learn such non-structural operations? Perhaps I have asked the wrong people, but when I have queried researchers doing connectionist modelling, the answer appears to be 'yes'. If that's the case, then connectionist mechanisms as currently developed do not constitute an explanatory model of human language abilities: they are too powerful.

Another topic in S & G's essay is the relationship between performance and competence in acquisition. S & G write: 'A number of EL authors posit that understanding the nature of performance factors – in both adults and children – can give insight into the origins of the elegant structures that constitute language. This hypothesis is radical in proposing that performance (not just competence) can be critical to the acquisition process'. Among the chapters that S & G comment on in this regard are a chapter by MacDonald,

who suggests parsing preferences reflect domain-general (rather than language-specific) conditions on information organization (short elements before long), and a chapter by Elman, who proposes that early limitation on working memory may help the learner, a proposal similar to Newport's (1990) suggestion that a limited processing span may help the learner get to grips with morphological information. There are several points that I believe should be separated out in evaluating the relationship between performance and competence in acquisition, and the contribution of connectionist/ emergentist research to the issue:

1. Processing models that eschew or minimize principles of processing and aim to put the burden of explanation on working memory limitations are not confined to connectionist/ emergentist research. See, for example, Gibson 1998.

2. The claim that working memory capacity limitations may guide processing and acquisition is not necessarily the same thing as saying processing is guided by domain-general constraints. See, for example, Waters & Caplan 1996.

3. The idea that performance factors may help explain paths of acquisition is not particular to emergentist research. I will list here three examples of work that has attempted to develop performance explanations of child behaviour, two of which involve my own research: first, there are accounts of children's early production of subjectless sentences in terms of performance deficits (for example, Valian & Eisenberg 1996); second, children's assignment of pronominal reference has been analysed in terms of limitations deriving from the architecture of the processing mechanism (Goodluck 1990); third, children's preferences for placement of question words have been accounted for in terms of processing effects that apply in adult sentence processing also (Goodluck, Saah & Stojanović 1995, Saah & Goodluck 1995, drawing on processing work in the vein of Pickering & Shillcock 1994 and Frazier & Clifton 1997). In the case of question formation, it is possible to speculate that the processor has had an evolutionary role in shaping competence (the structural type of question that is permitted across languages is the type that the processor promotes) and that the processor may limit the child's hypotheses in such a way that principles of acquisition *per se* (in particular the subset principle of Berwick, 1985) can be dispensed with (Goodluck, 1997).

A limitation on our ability to draw conclusions about language acquisition from connectionist research is the nature of the problems tackled to date. Connectionist treatments of acquisition have largely focused on problems in speech perception and morphology, but to my knowledge have yet to come

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to grips with such phenomena as knowledge of the structural restrictions on pronouns and anaphors, or cross-linguistic variation in structural mechanisms for forming questions, despite the fact that these areas have been central in linguistic theory for the past three decades and the topic of considerable empirical work on acquisition. It is one thing to focus on a clearly delimited research problem, it is another to limit the domain of inquiry to particular types of problem and extrapolate from that to make claims about language learning in general.

To sum up, I have tried to make three points: emergentist/connectionist research has not been shown to impose the restrictions on human language design that we know exist; emergentist/connectionist research is not unique in seeking explanation in the nature of the performance mechanisms; and the range of problems tackled in emergentist/connectionist acquisition research is quite restricted. These comments should not be taken to imply that I do not stand in awe of connectionist achievements in simulating learning paths, and I expect that extensions of such work to the kinds of phenomena mentioned above will lead to a better understanding of the strengths and limitations of such research.

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