

Emergence is what?

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The commentaries provide a thoughtful range of responses that reflect the existing theoretical diversity concerning explanations of language development. Below we clarify and amplify a few points from our original review that appeared to have been unclear.

Theoretical distinctiveness

Perhaps our most controversial decision was to put forth a strong version of the emergentist account – that domain-general tools were sufficient to provide the rich and complex patterns that characterize language and its development. Our reason for doing this was to assess a version that was THEORETICALLY DISTINCT from other approaches to language learning. A number of theoretical perspectives have highlighted the interaction between domain-specific constraints and domain-general cognitive processes. For instance, Pinker (1999) has suggested that understanding the relation between domain-general processes and language-specific principles has been fruitful in understanding the neural mechanisms that are important for acquiring and representing various kinds of past-tense constructions in English. In her commentary, Goodluck also noted ways in which modern formalist approaches integrate domain-general and domain-specific mechanisms. Thus, our goal in characterizing the strong version was to examine a position that is uniquely emergentist.

It is important to note that the decision to characterize a strong version of the hypothesis was NOT based on an assessment of the weaker version as incoherent or untestable. There are a number of cases throughout *EL* where a particular hypothesis about language processing or language development was clearly testable. However, when these models explicitly invoked both domain-general processes and domain-specific constraints, our question regarded what made them representative of an ‘emergentist’ perspective, and not some other perspective. Most typically, the quality that made a particular model emergentist was the extent to which the authors claimed it relied primarily on domain-general processes and NOT domain-specific ones. This, too, argued for characterizing the strong version of the emergentist perspective.

It was disappointing that none of the commentaries attempted to defend what we called the strong, and most interesting, form of emergentism.

Consequently, one has to wonder how forcefully (or even whether) the strong version can be defended. Relatedly, Lust raised the question of whether a tenable version of *EL* sketches out a truly new approach or is instead a complementary take on preexisting frameworks for studying language acquisition. We agree with Shatz, that if the goal of *EL* is explicitly to establish a new paradigm, one that is marked in particular by its minimization of language knowledge, it seems unlikely that we will make progress on the debates that have carried on over the past 30 years. On the other hand, if the goal is to explain language behaviour, then different perspectives on the same problems should complement and inform one another.

Sophisticated and careful thinking about cognitive processes

Regardless of whether it truly delineates a new theoretical perspective, it is clear that research labeled as emergentist has a distinct quality that makes an important contribution. Specifically, what is most striking about the emergentist approach is the sophisticated way in which general cognitive mechanisms are approached and conceptualized. These characterizations set the stage for the most compelling hypotheses put forth throughout the volume (e.g. Elman's take on the 'less-is-more' hypothesis, in which memory DEVELOPMENT is seen as playing an important role in word learning). Similarly, we feel that the chapters by MacDonald and Gupta & Dell also represent excellent examples of how sophisticated thinking about general cognitive mechanisms can lead to some unexpected (at least at the surface level) hypotheses and explanations regarding regular linguistic phenomena. This approach provides a valuable contrast to arguments that are constructed from a summary dismissal of a 1950s version of cognitive psychology. By taking a more informed view of cognitive processes, we can understand better the ways in which, paraphrasing MacWhinney, general cognitive mechanisms give rise to domain-specific landscapes.

At the same time, however, it is equally important to emphasize careful thinking about domain-general cognitive processes when characterizing their contribution to language. When considering candidate domain-general cognitive processes, we assumed that among them would be working memory, statistical learning, pressures on memory organization and retrieval, and even the forces of the body that constrain speech production. In our original article we discussed a number of reasons we felt that an accounting of the role that these play in language would be very useful. Among these reasons were parsimony – no domain-specific knowledge needs to be posited to account for their role. However, there are instances in *EL* where domain-specific knowledge is required to account for the performance of a cognitive mechanism that an author claimed was domain-general. For instance, MacWhinney's model of how perspective-taking processes may be the mechanism by which grammatical processing takes place is provocative, but

considerable domain-specific knowledge is required to carry out perspective taking. A number of researchers have suggested that there is nothing transparent about taking others' perspectives (Gopnik & Wellman, 1994). Indeed, there may be nothing transparent about recognizing our own perspective (Gopnik, 1993). The fact that perspective taking is, as MacWhinney says, 'grounded in the body and brain,' does not help to make perspective-taking any more transparent. In this case, it is misleading to characterize perspective-taking processes as somehow less rule-laden or more parsimonious with respect to cognitive processing.

A further point regarding cognitive processes is Menn's important distinction between domain-specific KNOWLEDGE and domain-specific CONSTRAINTS. On our view, an interesting and unique emergentist argument would be one that appeals to both domain-general and domain-specific constraints – specific ways that cognitive (or non-cognitive) mechanisms render the particulars of language – but WITHOUT appeal to domain-specific knowledge. In this regard, MacWhinney's example of the vocal tract exemplifies a domain-specific CONSTRAINT but not domain-specific KNOWLEDGE. It is important to continue sophisticated and careful characterizations of both domain-general and domain-specific constraints.

Rules don't have to be innate

One potential confusion in discussions of language emergence is that two factors that are often conflated are in fact orthogonal (at least in principle): innateness and presence of rules and constraints. Although many researchers have posited innate knowledge that guides semantic and syntactic development, not all researchers who study rules are committed to a nativist claim. For instance, some scholars have suggested that children's expectations about language can be acquired in the course of conversation with parents (e.g. Clark, 1993). On this approach, development is characterized in terms of the acquisition and elaboration of specific principles; in other words, language is learned via a DEVELOPMENTAL process (and is not simply 'acquired'). See, for example, Golinkoff *et al.* in *EL*. A developmental approach to linguistic rule use seems to us to provide a fruitful path for understanding how general cognitive mechanisms and pressures interact with more specific knowledge bases in the service of language acquisition.

Test cases

We would like to conclude by reiterating the call for identifying test cases that can help to distinguish emergentism from other approaches. In his commentary, MacWhinney noted that there are a number of ways in which predictions generated by an emergentist framework contrast with predictions generated by a formalist framework. However, we feel that it will also be interesting for emergentism to differentiate itself from other frameworks that

emphasize the dynamic interaction of domain-general constraints and domain-specific knowledge. Goodluck noted that one classic problem that is typically overlooked in emergentist approaches to language is why certain forms are NOT produced. Goodluck's challenge, then, concerns whether one can develop an emergentist model that learns the regularity in question, but will not learn an alternate regularity (see also Grinstead). It is important to focus on test cases that play a central role in linguistic theory in order to better discriminate among alternative approaches.

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