1990). Pidgins are protolanguages used by people from different linguistic backgrounds who are brought together to live and work, whereas creoles are true languages. More convincing yet of children's collective ability to invent language comes from a generation of deaf Nicaraguans who had not been exposed to a developed language and who, prior to attending a new school for the deaf, communicated using idiosyncratic home-sign systems. Shortly after arriving at the school, these home signers developed a shared system of signs and grammatical devices. This shared system developed into a full-fledged sign language after several years and several cohorts of typically young, deaf individuals without the need for instructions or adult models (Senghas & Coppola 2001; Senghas et al. 2004).

The emergence of new skills, such as language or its antecedents, in a group of individuals can place them in novel contexts and expose them to new selection pressures. This would surely have been the case with the emergence of language and its underlying symbolic abilities. We argue, as have others (e.g., Gottlieb 2002; Lickliter & Schneider, in press; West-Eberhard 2003), that the neural plasticity of infants and children and their behavioral and cognitive responses to novel environments provide much of the stuff upon which natural selection works, and that this may have been especially important in recent human cognitive evolution (e.g., Bjorklund 2006). Such plasticity may continue to afford the opportunity for phylogenetic change in *Homo sapiens*. For instance, the Flynn effect, a steady rise in IQ (particularly fluid intelligence) over the past century, may be due to accelerated cognitive development (Howard 2001), perhaps in response to an increasingly visual environment (see Neisser 1988). We do not believe that the human race is on the verge of a radical evolutionary change; but the neural plasticity evident in contemporary children in response to changing environments likely also characterized our ancestors and contributed centrally to the emergence of language and related sociocognitive abilities in our forechildren.

Reconciling vague and formal models of language evolution

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Abstract: One way of dealing with the proliferation of conjectures that accompany the diverse study of the evolution of language is to develop precise and testable models which reveal otherwise latent implications. We suggest how verbal theories of the role of individual development in language evolution can benefit from formal modeling, and vice versa.

Research into the evolution of language is growing rapidly and its study now cuts across several disciplines. Despite the diverse sources of insight which make up this field of study, few would disagree that understanding how and why our species-specific linguistic communication system came to be, requires a consideration of the interactions among three processes: biological evolution, linguistic evolution, and individual development (e.g., Christiansen & Kirby 2003b). Consequently, we were pleased to see Locke & Bogin's (L&B's) target article focus on one often-neglected component – individual development – and its relation to biological evolution. However, in order to understand the implications of a theory of individual development and its relationship to the evolution of language, we must go beyond vague models whose implications are hard to gauge and move towards more formal and testable models.

Dominating the study of language evolution is the desire to understand the unique form of structural complexity we see in human language. In other words, we seek an explanation of how certain forms of complexity arise from an initial state where that complexity was lacking. As L&B discuss, language is a communication system used in many interesting and unique ways. However, it is misleading to assume that by studying the communicative uses to which language is put we can gain insight into why language is so structurally distinct from other communication systems. L&B emphasize that language is used to support functions which contribute to an individuals' reproductive success. However, the degree to which the *specific* structure of language is *required* for such functioning is by no means clear. First, although most organisms communicate, and those that do so effectively are likely to be at an advantage over those that do not, only one species has language. Second, one can imagine *many* candidate communication systems that fulfill such requirements. Furthermore, language arguably does a fairly bad job as a communication system (e.g., Chomsky et al. 2002). In sum, the evolution of language cannot be explained by its communicative function alone.

To fully understand language and its emergence we have to understand the interacting adaptive systems that have driven its evolution. An important tool in this endeavor is the use of formal modeling, which allows us to explore the implications of precise and testable hypotheses. The growing interest in the evolution of language has been accompanied (some might say spurred) by an upturn in mathematical and computational models (e.g., Briscoe 2002; Cangelosi & Parisi 2001; Hurford 1989; 2005; Kirby 2002; Nowak & Komarova 2001).

We would like to highlight how formal approaches to studying the evolution of language can profit from further consideration of the process of individual development. First, development is a crucial step in determining the class of acquirable communication systems. The ontogenetic development of the cognitive machinery responsible for processing languages may be tied to stages in the life course, and this developmental path is likely to be crucial to understanding the structural characteristics of language. For example, computational modeling of language acquisition has shown the importance of considering how language structure relates to cognitive systems and their development. Elman (1993) used neural network simulations to show how networks can learn certain forms of linguistic structure if memory is started small and then gradually expanded. This mirrors the development of short-term memory capacity in humans and suggests that the mind may be tuned to develop in particular ways to facilitate learning. Elman's work demonstrates how the maturational trajectory over an agent's lifetime can impact on what is and what is not ultimately acquirable. Furthermore, the particular form of inductive bias that defines the language learner has a knock-on effect when we consider which kinds of structure can withstand repeated cultural transmission (Brighton et al. 2005b; Smith 2004).

Second, individual development is characterized not only by changes in cognitive aspects but also in social aspects, such as the structure of social networks. The social networks in which a developing individual is situated impacts on how language is transmitted between generations (e.g., Kerswill & Williams 2000; Ragir 2002). If constraints on how language is transmitted from one generation to the next impact significantly on the distribution of linguistic forms (e.g., statistical universals; for a discussion see Brighton et al. 2005a), then the social networks through which language is transmitted are likely to play a significant role (Smith & Hurford 2003). Hence, the implications of changing social networks that L&B discuss could be explored by investigating how they impact, over a cultural timescale, on the distribution of language's structural characteristics.