

Form, meaning and speakers in the evolution of language

Commentary on Kirby, Smith and Brighton

William Croft

University of Manchester/Center for Advanced Study in the Behavioral
Sciences

Kirby et al. discuss the problem of the evolutionary origin of language and offer a simulation of a method, iterated learning, to deal with the problem of how linguistic structure emerged. I will examine here what Kirby et al.'s simulation might tell us about this problem, in both generative and functionalist terms.

Kirby et al. frame their theoretical discussion in terms of the generative model of UG and the assumption of the child-based approach to language change (where language change is effected by children intuiting a different grammar from their parents in acquisition). Yet there are many serious empirical problems with both UG as a model of language universals and the child-based model. Four decades of cross-linguistic research has demonstrated that language universals can only be formulated as universals constraining variation, not as absolute universals of the form 'All languages have X'. Although parameters have been introduced to accommodate such variation, the empirical predictions (where tested) rarely succeed, partly due to sampling problems and partly due to the rarity of biconditional universals (see Croft 2003, especially §3.5). The child-based model is also problematic. The sort of changes that are attested in language history are not the same as those found in child language behavior. Children are remarkably good at intuiting the same grammar as their parents even though they are almost never given direct negative evidence. This is called the 'no negative evidence' problem in child language acquisition. Whatever the solution to this problem is, it indicates that language acquisition is remarkably robust, and does not appear to be the cause of language change. Finally, children as a social group do not become agents of linguistic change (that is, driving forward the propagation of an innovation) until adolescence, and by that time, the child language acquisition process has largely ended (see Croft 2000, §3.2 and references cited therein).

Does Kirby et al.'s model presuppose a generative UG or the child-based model of language change, with its serious empirical problems? Not really. Kirby et al.

argue that innate capacities need not be domain-specific. If not, then their notion of UG is essentially the functionalist position: innate human capacity for language is part and parcel of more general, presumably innate cognitive and social capacities. Kirby et al.'s simulation model involves agents who revise their internal grammars upon hearing an utterance produced by another agent. Kirby et al. describe the interlocutors as 'adult' and 'learner', following the child-based model. But this isn't necessary: the interlocutors could equally be described as adult speakers adjusting their grammatical knowledge by exposure to language use — precisely the usage-based model of language change advocated by functionalists. So Kirby et al.'s model does not presuppose a generative approach to UG or language change.

What do Kirby et al.'s model and simulation tell us about language evolution, then? They present one specific example of a simulation, from Kirby (2002). This example demonstrates that a system of agents starting with random expressions for individual meanings can evolve a recursive compositional syntax, a basic property of language. A functionalist might describe what the model demonstrates as the emergence of iconicity, since the structure of the expressions reflects the structure of the semantic representation, a predicate calculus. However, much is built into the model. The recursive compositionality is already there — in the predicate calculus representation of meaning. The model uses a generalization algorithm based on the structure of the semantic representation, improving its grammar where the two match (Kirby 2002: 179–82). So a bias for an iconic mapping is already there as well. Kirby et al.'s simulation demonstrates that a system given a recursive, compositional 'language of thought' (the semantic representation), and the opportunity to construct an iconic mapping between the 'language of thought' and another language, is able to do so under suitable circumstances.

This is an interesting result, but one must not read too much into it. Kirby et al. suggest that a holistic protolanguage (where a string denotes a whole semantic proposition without being analyzable) of the sort that Wray (1998) proposes would be unstable. But Wray did not intend her holistic protolanguage to be unstable, and its instability in the simulation is due to the presumption of the predicate calculus semantic representation plus the generalization algorithm based on it. Kirby et al. also suggest that their model demonstrates that "social transmission favors linguistic generalization" (p.597). But the meanings are randomly generated by the speaker, and the listener is given the meaning along with the speaker's expression to analyze. The ability to generalize is built into the grammar-constructing algorithm and is a function of the relation between the expression and the meaning, not the relation between the listener and the speaker.

I believe the real question is, where did the 'language of thought' come from? The world does not come parsed into language-like predicate-argument structures. I suspect that by the time our ancestors had analyzed the world into such structures, they were well on their way to formulating them as multiword utterances. In other words, the evolution of conceptualization and the evolution of language probably proceeded hand in hand. And a substantive model of social interaction should

probably play a significant role in determining how the world is conceptualized and analyzed for the specific purpose of human communication through language.

Kirby et al. suggest that we can flip the locus of selection from the grammars to the linguistic utterances themselves, referring to my proposals along those lines. I obviously agree that this is a good, in fact better, way to look at language change. Kirby et al. however worry about “transformation from internal representation to external behavior and back again” (p. 601), and finding “examples where the needs of language (to survive from generation to generation) and the needs of its users (to communicate easily and successfully) diverge” (p. 602). But both of these concerns are based on a faulty theory (not theirs!) of the selection process and how it applies to language and other cultural phenomena.

There is no ‘transformation’ from internal representation to external behavior. There is replication by speakers of linguistic structures in utterances. That replication process is of course mediated by the speakers, more specifically their knowledge about their language. But there are many examples of mediated replication, including the canonical biological example of DNA; not all replication is self-replication. There is nothing incompatible with the view that linguistic structures in utterances are replicated by speakers. Speakers’ knowledge is an important part of the evolutionary process, of course, but it plays a different role.

This role can be defined in response to Kirby et al.’s second worry. Not all replication is governed by self-selection. Evolution is a two-step process: replication and the variation generated in replication, and environmental interaction leading to selection (propagation or extinction of variants). There are two distinct roles for the two steps of the process: replicator and interactor. In gene-based biological evolution, genes are replicators. But as Hull (1988) points out, interactors occur at many levels of the biological hierarchy. Genes may be interactors, but so are cells and organisms. Genes, cells, and especially organisms all interact with the environment in such a way as to cause differential replication, that is, selection, of the relevant replicators (genes).

In language change, speakers are interactors, in fact, one of the most important interactors in the process. In other words, speakers play a different role in an evolutionary model of language change than language, that is, linguistic structures in utterances. It is not a matter of different needs of language and language users (speakers). Rather, speakers’ interactions with their environment — what is to be communicated and above all who they are speaking to — causes selection of linguistic structures in utterances. Both speakers and utterances play essential roles in an evolutionary model of language.

References

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Author's address

William Croft
Center for Advanced Study in the Behavioral Sciences
75 Alta Road
Stanford CA 94305
USA
croft@casbs.stanford.edu