



Comment

Where could biolinguists and evolutionary linguists meet?  
Comment on “Modeling the cultural evolution of language”  
by Luc Steels

Tao Gong

*Department of Linguistics, University of Hong Kong, Hong Kong*

Received 13 October 2011; accepted 13 October 2011

Available online 25 October 2011

Communicated by L. Perlovsky

---

*Keywords:* Evolutionary linguists; Biolinguists; Computer simulation

---

Luc Steels [1], based on the distinct emphases on the roles of biological evolution and cultural evolution, incisively separates language evolution researchers into biolinguists and evolutionary linguists, and evaluates some modeling studies showing that general mechanisms (e.g., invention and alignment of forms, structural coupling of concepts, and recruitment of cognitive functions for linguistic purposes) are sufficient to trigger linguistic conventions, shared conceptual systems, and linguistic hierarchy. Before applauding on this cultural perspective of language evolution, we need to note that some aspects of it still call for solutions from a biological perspective.

First, nonlinguistic constraints may directly cast their influences on language evolution, leading to universals or variations. For instance, the subitizing limitation in general cognitive tasks causes the maximum number of verb valence as 4 in most languages [2], the memory load [3] and cognitive constraints [4] lead to biases towards certain forms of constituent word order, and the perceptual constraints of human eyes trigger the universal color categorization patterns among languages [5]. Approaches from biolinguistics help identify such constraints and evaluate their roles in language evolution, which have important bearings on the relations of language, individual learners, and socio-ecological environments. In addition, nonlinguistic constraints, in the form of particular neural networks that regulate brain functions, can affect the recruitment of cognitive functions [6]. To understand these operational constraints, we need to examine the brain structures resulting from biological evolution and subject to change due to other cognitive activities [7].

Second, the recruitment theory [8] needs to address the level difference of language-related abilities between humans and nonhuman animals. Comparative evidence from biolinguistics has revealed many of such differences [2,9]. What factors enable the recruitment of cognitive functions into language processing and why the levels of those functions become different after recruited are intriguing to both biolinguists and evolutionary linguists. Interaction between biological and cultural transmissions may serve as a plausible solution to these puzzles. Communicative success during

---

DOI of original article: [10.1016/j.plrev.2011.10.014](https://doi.org/10.1016/j.plrev.2011.10.014).

E-mail address: [gtojty@gmail.com](mailto:gtojty@gmail.com).

cultural transmission of language may not only trigger the recruitment of necessary cognitive functions, but also adjust their levels to better serve the communicative purpose. Such selection is achieved mainly by biological evolution, and once the initial levels of those functions are adjusted, cultural evolution may help preserve the adjusted levels across generations, as analogous to the cultural ratchet effect [10]. Since biological evolution proceeds much more slowly than cultural evolution, this selective pressure may cast only on general functions not language-specific [11]. This will lead to a coevolution of language and adopted abilities in the linguistic domain.

Much remains to be discovered on these aspects in which biolinguists and evolutionary linguists share common interests. A unified perspective that coordinates the approaches from both fields would yield important insights on biological evolution, cultural evolution, and their interaction.

## References

- [1] Steels L. Modeling the cultural evolution of language. *Physics of Life Reviews* 2011;8(4):339–56 [in this issue].
- [2] Hurford JR. *The origins of meaning*. Oxford University Press; 2007.
- [3] Ferrer-i-Cancho R. Some word order biases from limited brain resources: A mathematical approach. *Advances in Complex Systems* 2008;11:393–414.
- [4] Gong T, Minett JW, Wang WSY. A simulation study on word order bias. *Interaction Studies* 2009;10:51–76.
- [5] Baronchelli A, Gong T, Puglisi A, Loreto V. Modeling the emergence of universality in color naming patterns. *Proceedings of the National Academy of Sciences* 2010;107:2403–7.
- [6] Sporns O. *Networks of the brain*. MIT Press; 2011.
- [7] Scholz J, Klein MC, Behrens TEJ, Johansen-Berg H. Training induces changes in white matter architecture. *Nature Neuroscience* 2009;12:1367–8.
- [8] Steels L. The recruitment theory of language origins. In: Lyon C, Nehaniv CL, Cangelosi A, editors. *Emergence of communication and language*. New York: Springer-Verlag; 2007. p. 129–50.
- [9] Fitch WT. *The evolution of language*. Cambridge University Press; 2010.
- [10] Tomasello M. *The cultural origins of human cognition*. Harvard University Press; 1999.
- [11] Christiansen M, Chater N. Language as shaped by the brain. *Behavioral and Brain Sciences* 2008;31:489–558.