

Book Review

Fitch, W. Tecumseh. 2010. *The Evolution of Language*. Cambridge: Cambridge University Press

Evolutionary linguistics aims to identify when, where and how human language (henceforth simply “language”) originates, changes, and dies (Ke and Holland, 2006). Due to lack of direct evidence, the evolution of language remains one of the hardest problems in science (Christiansen and Kirby, 2003b). Nonetheless, over the past half century, the persevering efforts of scholars from a variety of disciplines have led to fruitful and exciting achievements concerning the study of language evolution (for overviews, see Christiansen and Kirby, 2003a; Bickerton and Szathmáry, 2009; Smith et al., 2008, 2010; Gong et al., 2010). With his monograph *The Evolution of Language*, W. Tecumseh Fitch, a cognitive biologist from the University of Vienna, has now equipped us with a comprehensible guide to the field of evolutionary linguistics.

As stated in its Introduction, the purpose of the book is to stress the importance of modern biology in evolutionary linguistics research and to examine two research approaches: (i) the *pluralistic multi-component approach* and (ii) the *broad comparative approach*. The former approach views language as a *composite system*, consisting of partially separable components that are pieced together via evolutionary tinkering; the latter relies upon comparative data on a wide range of species, not exclusively primates, to evaluate theories of language evolution.

The fifteen chapters that follow are organized in four sections. Section 1 reviews the disciplines and data that are relevant for language evolution. It first defines the biolinguistic perspective (Larson et al., 2009) on language and summarizes the major debates on language evolution. Subsequently, it reviews theories of natural, sexual, kin, and group selection and outlines the controversies among these evolutionary theories. The author points out that many debates on language evolution are situated within these general theories, and that language serves as the best model to study evolution. He then addresses the concept of Universal Grammar, which he conceives of as the innate constraints on the acquisition of syntax, phonology, or semantics; but he suggests an alternative term, “faculty of language in the broad sense (FLB),” to refer

to these constraints. In the following, he discusses the components of FLB and their biological foundations and provides a review of the theories on the evolution of syntax and pragmatic inference. In conclusion, the author proposes that many phonological, semantic and syntactic phenomena are shared by non-human species, rather than being exclusively human.

Section 2 presents a whirlwind tour of human evolution, from single-cell life forms to the *last common ancestor shared by humans and chimpanzees* (LCA). It demonstrates that most human biology is shared with other species and can be traced back to the common ancestors that humans share with these species: e.g., many language-related traits in humans date back to the hypothesized urbilaterian (the common ancestor of vertebrates and insects) living 500 million years ago. The author then tries to infer some characteristics of the LCA, especially its poorly developed vocal control. He further points out that the phenomena of paternal care and alloparenting favored the development of pragmatic inference and intentional information sharing in early hominids, which led to a linguistic system capable of transferring thoughts among individuals. Finally, the author discusses *Homo erectus*, who lived 1.9 million years ago, and his possible form of *protolanguage* (the hypothetical stage of language evolution assumed to link the ancestral system(s) of communication in the LCA with modern language), but the available fossils fail to reveal any clear features of this protolanguage.

Section 3 focuses on the evolution of speech. It first defines speech as a signaling system and contrasts it with language, which is seen as a more general system for expressing thoughts, incorporating several signaling systems. A broad comparison between humans and other mammals reveals that the descent of the tongue root in humans is more critical for speech production than the descent of the larynx. The section proceeds to discuss the evolution of vocal control and examine the phylogeny, function, ontogeny, neural mechanisms, and genetic bases of complex vocal control and imitation. Another broad comparison between songbirds, chimpanzees, and other mammals shows that the critical period and babbling stage in the ontogeny of speech are also present in the ontogeny of songbirds, and that the neural mechanisms underlying complex vocal imitation are largely shared among animals. Only humans, however, have direct cortical-laryngeal connections. Finally, some aspects specific to speech are examined, including biologically grounded phonological principles, motor-perceptual constraints, and cultural transmission. The last part of the section briefly reviews some computational models of phonological change and points out that the simulation approach is helpful for evaluating simple but abstract principles that drive complex phenomena.

Section 4 discusses different hypotheses concerning the origin of language. After reviewing the Western theories of language origin before Darwin, the

author evaluates three more recent hypotheses of language origin, which postulate “lexical,” “gestural,” and “musical” protolanguages, respectively. According to the “lexical” protolanguage hypothesis (Bickerton, 1990), protolanguage consisted of a large number of learned, meaningful words, whereas syntax did not develop until the last stage. Fitch criticizes that this hypothesis can only account for some components of the language faculty, leaving others (e.g., vocal imitation and phonology) unexplained; furthermore, it takes for granted that early hominids could voluntarily control their vocal expressions. The “gestural” protolanguage hypothesis (Corballis, 2002) posits that protolanguage first consisted of meaningful gestures and gradually shifted to the auditory domain. Fitch points out that the arguments based on the mirror neurons upon which this hypothesis relies lack supportive empirical evidence, especially in humans, and that the role of mirror neurons in the transition from gestures to spoken language needs further investigation. The “musical” protolanguage hypothesis, originally proposed by Charles Darwin (1871), assumes that protolanguage resembles non-lyric songs, with complex phonological structures but no meanings, and that semantics entered in the last stage. Fitch agrees on the close resemblance between music and language and their intricate relation in the brain, but he also observes that language lacks one design feature of music, namely repeatability. This limits the explanatory power of the “musical” protolanguage hypothesis. Fitch concludes from his evaluation that creative combination of various approaches would enrich the current debates on language origin, and he argues that, rather than proposing new hypotheses, future research should focus on testing the available ones, using comparative, data-driven, and multi-component approaches.

Among the existing books on the evolution of language, Fitch’s book stands out in several important ways. First, Fitch criticizes the practice of blindly and superficially referring to theories of language evolution, and suggests reinterpreting classic theories, especially Darwin’s. He evaluates the debates on contemporary evolutionary theories from the perspective of a broad evolutionary framework, including theories on syntax evolution, models of speech evolution, and hypotheses about protolanguage.

Second, the book contains fruitful innovations. Fitch adopts the concept of “evolutionarily stable strategy” from game theory to evaluate whether a mutant strategy is advantageous, and the “evo-devo” theory from developmental biology to argue that regulatory genes remain conservative over evolutionary time, which ensures convergent evolution and deeply homologous traits across species. In addition, he argues that both non-human animals and the LCA have well-developed concepts of space, time and causality, but the LCA could also link mental concepts with arbitrary signs, even though its communication system was limited. From the perspective of evolution, concepts and ideas precede

language, and from the perspective of neuroscience, they are also independent of language. Furthermore, Fitch claims that children's impressive abilities of grasping meanings of words are not much different from the general abilities of acquiring concepts that are present in animals. And he incisively points out that many contemporary studies overemphasize the vocal tract configuration, which, in fact, is not a determining factor in the biology of language. Finally, Fitch suggests that kin selection triggers honest signals, and proposes a "kin selection plus reciprocal altruism" model to explain the origin of cooperation across species.

Third, the book proposes insightful methodology. Fitch advocates a biological view on language throughout the book. In particular, he emphasizes the *broad comparative approach* and compares more than 40 species with regard to their language-related abilities. Given his belief that language is an integration of multiple mechanisms, Fitch argues further that the *multi-component approach* is likewise necessary in the study of language and its evolution. Moreover, he suggests superseding the nature vs. nurture dichotomy with specific research questions where the focus is on testable empirical consequences of hypotheses on protolanguage. Finally, he emphasizes the importance of the *data-driven approach*, using objective data to test existing hypotheses.

Last but not least, the book shows that evolutionary linguistics involves not only linguistics, but also anthropology, speech science, genetics, neuroscience, and evolutionary biology. From the perspective of neuroscience, Fitch explores the neural mechanisms underlying complex vocal imitation, such as the brainstem chassis, midbrain control center, and cortical control systems; from the perspective of genetics, he investigates the fundamental genetic toolkits shared by humans and other species and discusses the regulatory roles of the FOXP2 gene in vocal control. Such interdisciplinary research provides a comprehensive understanding of the mechanisms underlying the evolution of language.

In spite of all these merits, the book inevitably has some shortcomings and limitations. First, as mentioned above, it reviews some computer simulations of phonological changes, but the simulation approach is not limited to this particular aspect of language evolution. There are many more simulation studies exploring the evolution of cooperation and altruism (e.g., Noble, 2000), lexicon (e.g., Ke et al., 2008), semantics (e.g., Vogt, 2002), categorization (e.g., Baronchelli et al., 2010), word order (e.g., Gong, 2009), morphosyntax (e.g., Steels, 2005), and other aspects of language. The simulation approach can easily be integrated with the other approaches advocated by Fitch, and the simulation-related studies already figure importantly within the literature of evolutionary linguistics (for overviews, see Christiansen and Kirby, 2003a;

Bickerton and Szathmáry, 2009). It would surely have been appropriate for Fitch to pay more attention to this newly-founded and insightful approach in his monograph.

Second, Fitch is justified in citing many recent findings on the FOXP2 gene, not only in humans but also in mice and birds, but he only discusses the regulatory role of this gene in language-related development. Other recent findings, however, show that the FOXP2 gene operates on a cluster of genes that are responsible not only for language development directly, but also for neurodevelopmental disorders such as autism, Alzheimer's disease, and schizophrenia (Stromswold, 2009). These disorders, which also affect language development, should be included in a thorough survey of neural factors that play a role in language evolution.

Finally, just like Hauser et al. (2002) (of which he is a coauthor), Fitch focuses on syntax and leaves semantic and phonological issues outside its purview, even though he does review semantic abilities in non-human species and models of phonological change. Such a syntax-biased perspective largely neglects the relevance of semantics and phonology in language evolution and runs contrary to some linguistic theories which stress that the generative capacities of language relate not only to syntax, but also to semantics and phonology (Jackendoff, 2009).

Nonetheless, the book's merits certainly outweigh its shortcomings. It successfully presents the fundamental current knowledge, mainstream theories, state-of-the-art findings, and open questions in evolutionary linguistics. The interdisciplinary perspective and the biological, comparative method are excellent guidelines for future research. This book will serve not only as an indispensable textbook for novices, but also as a valuable reference for specialists in evolutionary linguistics.

Tao Gong (corresponding author)
Department of Linguistics, School of Humanities,
The University of Hong Kong
Pokfulam Road, Hong Kong
gtojty@gmail.com

Qiang Wang
College of Foreign Languages,
Chongqing University of Posts and Telecommunications
400065 Chongqing, China
qiang_wong@163.com

References

- Baronchelli, Andrea, Tao Gong, Andrea Puglisi, and Vittorio Loreto. 2010. Modeling the emergence of universality in color naming patterns. *Proceedings of the National Academy of Sciences of the U.S.A.* 107(6): 2403–2407.
- Bickerton, Derek. 1990. *Language and Species*. Chicago: University of Chicago Press.
- Bickerton, Derek and Eörs Szathmáry (eds.). 2009. *Biological Foundations and Origin of Syntax*. Cambridge, MA: MIT Press.
- Christiansen, Morten H. and Simon Kirby (eds.). 2003a. *Language Evolution*. Oxford: Oxford University Press.
- Christiansen, Morten H. and Simon Kirby. 2003b. Language evolution: Consensus and controversies. *Trends in Cognitive Science* 7: 300–307.
- Corballis, Michael C. 2002. *From Hand to Mouth: The Origins of Language*. Princeton, NJ: Princeton University Press.
- Darwin, Charles R. 1871. *The Descent of Man, and Selection in Relation to Sex*. London: John Murray.
- Fitch, W. Tecumseh. 2010. *The Evolution of Language*. Cambridge: Cambridge University Press.
- Gong, Tao. 2009. *Computational Simulation in Evolutionary Linguistics: A Study on Language Emergence*. Taipei: Institute of Linguistics, Academia Sinica.
- Gong, Tao, Ruoxiao Yang, Caicai Zhang, and Umberto Ansaldò. 2010. Review of the Summer Institute in Cognitive Sciences 2010: The Origins of Language. *Biolinguistics* 4(4): 385–402.
- Hauser, Marc D., Noam Chomsky, and W. Tecumseh Fitch. 2002. The faculty of language: What is it, who has it, and how did it evolve? *Science* 298: 1569–1579.
- Jackendoff, Ray. 2009. Your theory of language evolution depends on your theory of language. In Larson, Déprez, and Yamakido 2009, 63–72.
- Ke, Jinyun and John H. Holland. 2006. Language origin from an emergentist perspective. *Applied Linguistics* 27: 691–716.
- Ke, Jinyun, Tao Gong, and William S.-Y. Wang. 2008. Language change and social networks. *Communications in Computational Physics* 3: 935–949.
- Larson, Richard K., Viviane Déprez, and Hiroko Yamakido (eds.). 2009. *The Evolution of Human Language: Biolinguistic Perspectives*. Cambridge: Cambridge University Press.
- Noble, Jason. 2000. Cooperation, competition and the evolution of prelinguistic communication. In Chris Knight, Michael Studdert-Kennedy, and James R. Hurford (eds.), *The Evolutionary Emergence of Language: Social Function and the Origins of Linguistic Form*, 40–61. Cambridge: Cambridge University Press.
- Smith, Andrew D.M., Marieke Schouwstra, Bart de Boer, and Kenny Smith (eds.). 2010. *The Evolution of Language: Proceedings of the 8th International Conference*. Singapore: World Scientific Press.
- Smith, Andrew D.M., Kenny Smith, and Ramon Ferrer i Cancho (eds.). 2008. *The Evolution of Language: Proceedings of the 7th International Conference*. Singapore: World Scientific Press.
- Steels, Luc. 2005. The emergence and evolution of linguistic structure: From lexical to grammatical communication systems. *Connection Science* 17(3–4): 213–230.
- Stromswold, Karin. 2009. Genetics and the evolution of language: What genetic studies reveal about the evolution of language. In Larson, Déprez, and Yamakido 2009, 176–190.
- Vogt, Paul. 2002. The physical symbol grounding problem. *Cognitive Systems Research* 3(3): 429–457.

Acknowledgement

This work is supported by the Society of Scholars in the Humanities at the University of Hong Kong. The authors thank Prof. Umberto Ansaldo from the University of Hong Kong for comments.