Language Sciences 41 (2014) 243–253

Contents lists available at SciVerse ScienceDirect

Language Sciences

journal homepage: www.elsevier.com/locate/langsci

Evolutionary linguistics: theory of language in an interdisciplinary space

Tao Gong [a,*], Lan Shuai [b], Bernard Comrie [c]

[a] Department of Linguistics, The University of Hong Kong, Pokfulam Road, Hong Kong
[b] Department of Electrical and Computer Engineering, Johns Hopkins University, 3400 North Charles Street, Baltimore, MD 21218-2699, USA
[c] Department of Linguistics, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany

ARTICLE INFO

Article history:
Received 18 December 2012
Received in revised form 1 May 2013
Accepted 6 May 2013

Keywords:
Language emergence
Innatism
Emergentism
'Bootstrapping' scenario
'Formulaic' scenario
Interdisciplinary perspective

ABSTRACT

This paper revisits the key questions in current thinking in evolutionary linguistics, reviews the alleged stages during language evolution, and evaluates the mainstream hypotheses on language emergence, namely innatism and emergentism. We summarize both the supporting and opposing arguments for these hypotheses and evaluate two scenarios respectively following these hypotheses. As we will show, many of these arguments require an interdisciplinary collaboration between linguistics and other disciplines such as cognitive sciences, psychology, neuroscience, genetics, animal behaviors, and computer simulation, which illustrates the interdisciplinary nature of evolutionary linguistics and highlights the opportunities for future engagement of our discipline.

1. Introduction

Human language (henceforth simply 'language') is arguably the central defining characteristic of our species. We have been wondering whether only our species is gifted with language, why language is the way it is, and how it became so. Preliminary explorations on these questions dated back to Charles Darwin's *The Origin of Species*, published in 1859.[1] However, most speculative conjectures based on the scientific conditions in the 19th century were devoid of sufficient empirical or experimental verification. Noting this, the *Société de Linguistique de Paris* imposed a ban on discussing these questions in scientific discourse in 1866. After nearly a century of 'silence', interests in these questions have been aroused in modern linguistics starting from the 1950s, thanks to the abundant collections of language data, comprehensive understandings on the behaviors of humans and other animals, and significant contributions from many other disciplines.

Modern linguistics comprises several subfields. For example, historical linguistics aims to account for changes observed in languages and historical relations among languages, linguistic typology targets on linguistic diversity and its causations, sociolinguistics focuses on sociocultural factors that could cause linguistic varieties, and psycholinguistics tries to identify psychological factors that enable humans to acquire and use a language. All these are in a position to make important contributions to the relatively new discipline of evolutionary linguistics.

Evolutionary linguistics (Hauser et al., 2007) aims to identify when, where, and how language originates, changes and disappears (Ke and Holland, 2006). Similar to historical linguistics and sociolinguistics, evolutionary linguistics studies the

* Corresponding author. Tel.: +852 51141386; fax: +852 25464943.
E-mail addresses: gtojty@gmail.com (T. Gong), susan.shuai@gmail.com (L. Shuai), comrie@eva.mpg.de (B. Comrie).

[1] In fact, philosophical discussions on language origins can be further traced back in history, such as Rousseau's and Herder's essays on language origin (Moran and Gode, 1966), Monboddo's 6-volume discussion in comparative historical linguistics (Monboddo, reprinted 1968), Condillac's thoughts about the nature of human language and knowledge (Aarsleff, 2001), and many others.

0388-0001/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.langsci.2013.05.001

manners in which language changes take place and the sociocultural environments in which language is used. Evolutionary linguistics also draws inference from the studies of *language acquisition* (the process whereby an infant acquires a language from its environment, Clark, 2003) and individual linguistic behaviors, which are conducted by developmental psycholinguists. Meanwhile, unlike historical linguistics which concentrates on particular languages or language families, evolutionary linguistics examines the shared linguistic features from a typological, or cross-linguistic perspective, and the relevant learning behaviors in humans. Apart from language acquisition, evolutionary linguistics also explores *language origin* (the process that accounts for the transition from a prelinguistic communication system to a communication system with languages of the sort we use today, allegedly in place around the early time of *Homo sapiens*, MacWhinney, 1999).

What is crucial to this field is that due to the difficulty in retrieving linguistic behaviors from fossil records (Hauser et al., 2002; Lieberman, 2006) we can only speculate what primitive languages of early hominins looked like and what capacities these hominins possessed to process their languages. Accordingly, studies in evolutionary linguistics, especially those on language origin, have been largely restricted to the data within a synchronic timescale. This is not a problem *per se*, as much of theoretical linguistics has predominantly been speculative. For example, syntactic theory, given the impossibility of retrieving actual evidence from the human brain in terms of language processing and production until very recently, is by and large engaged in speculating what kind of structures might be there, if there were a direct mapping of syntax in the brain. In evolutionary linguistics, an interdisciplinary perspective enables us, to some extent, to overcome this problem, based upon empirical evidence obtained in disciplines other than linguistics to verify some of those speculative linguistic theories. For example, the fossil records of our ancestors unearthed in northern Africa reveal that our species evolved into its modern form about 150,000 years ago (White et al., 2003). The archaeological records trace some baselines for the major human migrations such as sea crossing (Coupé and Hombert, 2002), which indirectly reflect the enrichment and refinement in communicative abilities of our ancestors during those periods. The genetic research helps identify some important language-related developments in the human genome (Enard et al., 2002; Fisher et al., 1998), and the beginning of the 21st century witnessed a combination of molecular genetics and neuroscience (Marcus, 2004; Fitch, 2010). This approach has important bearings on some age-old controversies such as whether there is a 'language organ' (Anderson and Lightfoot, 2002). Finally, statistical physics (Loreto and Steels, 2007) and computer simulation (Wagner et al., 2003; Gong, 2009) have recently served as new means of studying the dynamics of language evolution, reconstructing the trajectories of changes, and recapitulating the effect of relevant factors on evolution. This approach helps analyze other age-old discussions such as whether language originated from a single (Atkinson, 2011) or multiple sources (Freeman and Wang, 1996). Most of these approaches have been gradually accepted by interested linguists (e.g. Hurford et al., 1998; Tallerman, 2005; Bickerton and Szathmáry, 2009, 2011; Tallerman and Gibson, 2012).

In this paper, we briefly review the roles of linguistic theories in evolutionary linguistics from the interdisciplinary perspective. We begin by highlighting the fundamental questions of the field, followed by a summary of the major stages of language evolution and an evaluation of the mainstream hypotheses on language emergence.

2. Fundamental questions in evolutionary linguistics

2.1. How does language exist in humans?

Language phenomenon in our species can be divided into two parts:

(1) *Biological capacity for language*, which includes the basic functions of some physical organs and cognitive competences for processing linguistic materials, e.g. the vocal-auditory channel for exchanging communicative signals, associative memory for memorizing meaning-utterance mappings, and sequencing ability to regulate clausal components.

(2) *Idiolect and communal language*. Idiolects are the body of knowledge individuals use to handle a language (Kirby, 2002), including both the abstract grammatical knowledge and actual language use as attested in speech. Communal language is the extrapolation of idiolects, based on which speakers in a population can communicate successfully with each other most of the time (Mufwene, 2001). Communal language is the consensus of idiolects arising in use, and idiolect is the product of communal language an individual has access to (Kirby, 2002), both of which are developed by individuals using their biological capacities.

Some key questions on the biological capacity for language include: whether this capacity is language-specific (Chomsky, 1986; Pinker and Bloom, 1990) or it is derived from general abilities through exaptation (Gould and Vrba, 1982); and what are the roles of functional principles in the development of grammatical processing mechanisms (Hurford et al., 1998; Hurford, 2012). Many studies are evaluating the degree to which the predisposed capacity for learning and using a language is human-unique and how this capacity originates in the human lineage (Oller and Griebel, 2004; Lieberman, 2006), which are often classified as studies on *the evolution of language*. Topics concerning language itself include how idiolects or communal languages interact during *language contact* (the prolonged association among speakers of different languages, Thomason and Kaufman, 1988) or *cultural transmission* (the process whereby behaviors persist over time by being acquired and performed by a number of individuals, Christiansen and Kirby, 2003a). These studies are often classified as the studies on *the evolution of languages*, closely resembling those in historical linguistics and sociolinguistics.