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REVIEW

EVOLUTIONARY LINGUISTICS IN THE PAST TWO DECADES
EVOLANG10: THE 10TH INTERNATIONAL CONFERENCE ON
LANGUAGE EVOLUTION

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ABSTRACT

In this paper, by briefly reviewing the keynote speeches and pre-conference workshops of Evolang10, we revisited the flourishing development of evolutionary linguistics in the past two decades, and gave three comments on Evolang conference series, including: (a) reconsideration of the repulsive attitude toward historical linguistics research; (b) future directions of modeling and experimental studies; and (c) necessity of pragmatics and neuroscience explorations in evolutionary linguistics. In the end, we summarized the key contributions from Chinese scholars to evolutionary linguistics, rich linguistic resources in China, possible facets where Chinese scholars can make significant contributions, and current status of evolutionary linguistics research in China. We welcome and encourage more Chinese scholars to step into evolutionary linguistics and make our contributions to this booming field.

SUBJECT KEYWORDS

Evolutionary linguistics Modeling Pragmatics Neuroscience

Origins and evolution of human language, as one of the hardest problems in modern science (Christiansen and Kirby 2003a), have recently gained a wide scope of academic interests. In fact, for several millennia, our progenitors have never ceased the quest to understand these topics, despite the notorious ban on discussion of these topics from the Linguistics Society of Paris in 1866 (Stam 1976; Auroux 2013; Cohen 2013). After the first major effort to examine the origins and evolution of language in the 1976 conference (Harnad et al. 1976), apart from linguists, scholars from a number of sister disciplines have joined the endeavor to tackle these questions (Gong et al. 2010, 2013a). As demonstrated in recent monographs (cf. Lieberman 2002; Blevins 2003; Burling 2005; Dessalles 2007; Hurford 2007, 2012; MacNeilage 2008; Kinsella 2009; Fitch 2010; Clark and Lappin 2011; Arbib 2012; Bouchard 2013) and anthologies (cf. Wray 2002, 2008; Christiansen and Kirby 2003b; Minett and Wang 2005, 2009; Tallerman 2005; Bickerton and Szathmáry 2009; Botha and Knight 2009a, 2009b; Christiansen et al. 2009; Larson et al. 2009; Bannan 2012; Tallerman and Gibson 2012; Arbib 2013; Botha and Everaert 2013; Lefebvre et al. 2013; Wang 2013), research in evolutionary linguistics (MacWhinney 1999; Ke and Holland 2006; Bickerton 2007; Hauser et al. 2007; Gong et al. 2014) has now become flourishing.

Among numerous forums that advocate evolutionary linguistics, the biennial conference series on the evolution of language (Evolang) has been serving as a flagship. Ever since its birth in Edinburgh in 1996, Evolang has turned into a well-regarded academic community dedicated to interested scholars for reporting and evaluating both new and old hypotheses, theories, explanations, and findings on language evolution, as vividly shown in the conference proceedings (cf. Hurford et al. 1998; Knight et al. 2000; Cangelosi et al. 2006; Smith et al. 2008, 2010; Scott-Phillips et al. 2012a), reviews (cf. Wang and Gong 2008, 2011a; Coupé et al. 2013), and reports (cf. Balter 2010; Normile 2012). Evolang has witnessed the transition of research on evolutionary linguistics from the margins to a central stage and the emergence of a staggering diversity of perspectives on: why we humans are the only species that can master and use language; how language came to our species; why languages exhibit such diverse forms; and what are the roles of biological and socio-cultural factors in shaping linguistic forms and relevant individual

processing abilities. In April 2014, the 10th international conference on the evolution of language (Evolang10) was kicked off in Universität Wien, Austria (Cartmill et al. 2014). In this paper, we briefly review this landmark conference that recapitulates the maturation of the field of language evolution in the past two decades (eighteen years to be exactly).

1. KEYNOTE SPEECHES

As the co-founders of Evolang, James R. Hurford (University of Edinburgh) and Chris Knight (University of East London) share what they have observed and learned from the previous Evolang conferences.

Hurford first surveys many inter-disciplinary topics and theories on language evolution that have been developed during the past Evolang. These topics and theories are either outside linguistics (e.g., altruism, gene-culture coevolution, niche construction, or group selection), on the fringes of linguistics (e.g., pragmatics, communications, or agent-based simulation), or within linguistics (e.g., grammaticalization, competence and performance, or construction grammar). Then, he criticizes Chomsky's UG (Universal Grammar) theory that ignores natural selection and communication in language evolution. As regards communication, ontogenetically, it seems implausible to envisage language unfolding in children without communication as its main function; and phylogenetically, it is unreasonable that no antecedent of language exists in ancient communicative systems, (Hurford 2007, 2012; Zuberbühler 2013). Rather than UG, Hurford advocates a UG⁺ (Universal Grammar Plus) theory, which has incorporated memory and processing power, as well as coevolution of form and dispositions (Hurford 2012). To support UG⁺, he appeals for evolutionary theories that address the coevolution between competence and performance and between thought and communication. Apart from theoretical issues, he also evaluates the approach of using animal models to study linguistic competences, and stresses that the study of birds (or other animals) for recursive abilities is inappropriate, since the purpose of recursion in language is to keep track of meanings in long phrases, yet bird songs (or training/testing vocalizations to other animals) do not possess complex semantic information as in language. Furthermore, he points out several facets of linguistic constructions that demand in-depth research in the light of

evolution (e.g., constructions are not only abstract templates ranging from simple lexical items to complex idioms and with many variables, but also bundles of pragmatic, semantic, and phonological information). Finally, he sketches a number of multi-disciplinary directions in future research of language evolution, including linguistics (e.g., depict disappearing languages to understand the nature of language), genetics (e.g., discover genes directly or indirectly relevant for language to reveal the non-monolithic nature of language), neuroscience and animal behaviors (e.g., study the evolution of attention and memory from the first creatures with central nervous systems).

As a social archaeologist, Knight focuses more on socio-cultural factors, and suggests that language origin is not just an evolutionary process, but a social revolutionary process. He advocates research on primate politics and symbolic rituals (or other complex behaviors) that stretched back to the African Middle Stone Age and were probably associated with the speciation of *Homo sapiens*. Without such social activities, phonemes could not be associated with meanings to form lexical items. He also points out that generating trust is an important condition of language origins and evolution, since it requires many vocal signals to prove the authenticity. He highlights that compared to the dominance-submission hierarchy in primate societies, the “reverse dominance” principles in egalitarian hunter-gathers lead to the emergence of flexible joint attention, which paved the way for grammaticalization.

Apart from Knight, other plenary speakers also advocate that socio-cultural factors play crucial roles in language origins and evolution, and elaborate this perspective in their respective research fields.

Robert Boyd (Arizona State University) views language as a set of low cost (cheap talk), combinable signals for generating an unlimited range of messages. This feature also makes language vulnerable to deceptive signals (lies). Noting this, he discusses under what conditions an honest signaling system like language can be well-preserved in human communities. Based on the repeated Sir Philip Sydney Game, he proposes a mathematical model to explore the dynamics of the evolution of a low cost signaling like language. This model quantitatively reveals that when lies are easily detected, reciprocity is sufficient to maintain an honest signaling system, whereas if lies are difficult to be detected, it would be

hard for reciprocity alone to maintain an honest signaling system. In the latter situation, adding third-party monitoring and punishment could enhance the evolution of honest signaling (Boyd et al. 2010).

Joan Silk (University of California, Los Angeles) reports a number of long-term field observations of the social bonds among female baboons. These studies reveal that female baboons form strong, equitable, supportive, tolerant, and stable social bonds. These close bonds help them cope with different kinds of stress, and increase their longevities and infants' survival rates (Silk et al. 2009, 2010). To overcome the risk of conflict when living with close bonds, baboons use different types of grunts to facilitate proximity and affiliation, reconcile aggressive behaviors, and relieve anxiety. These communicative signals, though not language like, play a critical role in corroborating social bonds and resolving inherent risks. The social bonds among female baboons and their communicative signals serve as a testing bed for Boyd's mathematical model.

Instead of focusing on language origins, William Croft (University of New Mexico) concentrates more on language change. He defines evolutionary linguistics as the employment of evolutionary theories to understand language change (Croft 2000). After reporting a mathematical model of language change (Blythe and Croft 2012), he proposes an evolutionary framework on language change. This framework, inspired by the General Analysis of Selection (GAS) (Hull 2001), treats language change as a two-step process: generation of variation and selection of variants. In line with GAS, Croft views linguistic units as replicators (lingume) in language change, and speakers as interactors who select replicators during their interactions with the social and communicative environment. The relations between replicators and interactors allow defining and analyzing different types of social mechanisms. By treating these replicators and interactors as parts of a complex adaptive system (Beckner et al. 2009) for achieving joint actions (Croft 2009), he states that the origins of language must be interdependent on the evolution of social cognitive capacity (Tomasello et al. 2012; Tomasello and Vaish 2013), and that social selection is, and perhaps always has been, a critical part of the coevolution of language.

Apart from Croft's functionalism framework, Michael Arbib

(University of Southern California) advocates the Mirror System Hypothesis (MSH) (Arbib 2012). After clarifying a few doubts on MSH, he introduces three neural models of the macaque brain that set a baseline for the last common ancestor. Apart from theoretical argumentation, Arbib integrates experimental data of macaque brains, behaviors, and social activities with neural modeling, with the purpose of developing conceptual tools for modeling ape and human brains at multiple and hypothesizing gestural communications in the last common ancestor of chimpanzees and humans. He extends his previous neural models to study how ape brains support the development of novel gestures through dyadic interactions. For example, Arbib and colleagues (2014) simulate the ontogenetic ritualization scenario (Tomasello 2008), via which ape gestures could gradually emerge. Moreover, he introduces the mirror neuron involved framework to develop so-called template construction grammar, and discusses the evolutions of several neural capacities and circuitries that could support the acquisition, processing, and development of human language. Finally, he introduces the Brain Operation Database linking neural models with empirical data, and appeals for more similar databases allow comparing and searching empirical data for particular communities of experimentalists and/or field workers.

Ann Senghas (Columbia University) reports her long-term work on the Nicaraguan Sign Language (NSL). As a present-day naturally emerging language, NSL can inform us of language origins and change (Senghas et al. 2004). By comparing the signs made by four successive cohorts of NSL users, she traces the emergence of a verb construction in the NSL signs, and the transition from using mixed gestures to express manner and path of motion to using separate gestures to indicate this information (Senghas et al. 2013). By comparing the signs expressing meanings that involve animate-animate or animate-inanimate events, she discovers a similar animacy hierarchy as in many spoken languages (Comrie 1989), i.e., actions involving animate agents and inanimate patients tend to be unmarked, whereas those involving animate agents and animate patients are marked. Based on these studies, Senghas proposes a series of general steps during language evolution, including: (a) variation in form, due to unfaithful learning and creative generations; (b) selection of form, occurring when a form is successful for communication or it can

be successfully acquired; (c) selection of learning devices that can acquire more powerful languages and be mostly shared by users; and (d) iterative application of these devices, which leads to universal features in languages. This scenario apparently follows the “language as an organism” view (Christiansen and Chater 2008) and the language-cognition coevolution theory (Deacon 1997). It also reflects the effects of cumulative cultural evolution (Tomasello 2008; Dediu et al. 2013) on language evolution.

In line with Senghas, Kenny Smith (University of Edinburgh) also stresses the roles of cumulative cultural evolution in the origin of structure in language. Based on the iterative learning framework that was originally developed in computer simulations, he reviews recent simulation and experimental evidence that through cumulative cultural transmissions, compositional artificial languages can gradually emerge either among artificial agents, who are equipped with some general learning mechanisms, or in human subjects, who unintentionally induce compositionality during iterative learning and recalling processes (Kirby et al. 2008; Scott-Phillips and Kirby 2010). These studies indicate that linguistic structures are triggered by language learning and use. He then reports a mathematical model illustrating that language could be a product of gene-cultural coevolution (Levinson and Dediu 2013). This model simulates the Baldwin effect and demonstrates that through generations of language learning and use, strong language universals could derive from weak genetic biases, and only such weak biases can survive cultural transmission (Kirby et al. 2007; Smith and Kirby 2008). Finally, he reviews recent animal behavioral studies on cultural evolution of structure in non-human primates (Fehér et al. 2009), which corroborate the claim that systematic structure is an inevitable outcome of cultural transmissions and it is not limited to human communities.

2. PRE-CONFERENCE WORKSHOPS

Scholars from different disciplines organize five pre-conference workshops on a variety of topics concerning language evolution.

Carel ten Cate (University of Leiden) and Williem Zuidema (University of Amsterdam) organize the workshop on Comparative Biology of Artificial Grammar Learning. The theme of it is to discuss

whether the ability of applying abstract rules to create an unbounded set of linguistic utterances is uniquely human and evolved in consort with language, or it originated from more general cognitive abilities that might also be present also in other animal species via homology or analogy. Ten talks of computer simulations and artificial grammar learning experiments on rats, birds, and primates collectively present an overview of the state-of-the-art knowledge in this field.

Bart de Boer (Universiteit Brussel) and Tessa Verhoef (University of California, San Diego) organize the workshop on Evolution of Signals, Speech and Signs. The themes of it include: reporting recent research on physical signals used to convey language and potential precursors of these signals; and discussing open questions therein, such as how humans differ exactly from other apes in grasping physical signals and what the role of sign in language evolution is. Nine talks from linguistics, biology, animal behaviors, cognitive experiments, and computer modeling discuss the possible scenarios of language origin, the precursors of speech in primates, the transition from gestures to a sign language, the articulatory constraints on speech structure, the interaction of genes for deafness and the emergence of sign languages.

Andrea Ravignani (Universität Wien) and Bruno Gingras (Universität Wien) organize the workshop on EvoMus: The Evolution of Language and Music in a Comparative Perspective. The theme of it is to discuss and integrate hypotheses and findings from different disciplines to shed light on issues about the evolutions of language and music. Five talks, following the evolutionary, cognitive, simulation, experiment, and comparative approaches, report the recent findings on the drumming patterns in chimpanzees, the acquisition of visual and music recursive structures by humans, the emergence of whistle contours or stress patterns during cultural transmission, and the modeling of music and language learning based on the same transduction grammar induction.

Melanie Malzahn (Universität Wien) and Nikolaus Ritt (Universität Wien) organize the workshop on Evolutionary Linguistics and Historical Language Studies. The theme of it is to show the importance of historical linguistic research to our understanding of language change. Eight talks report the recent findings in historical linguistics that help reconsider the roles of socio-cultural factors in language change, how language

structures change, why languages change and thereby produce diversity, and how significant features in language parallel other related systems during language evolution. These studies are based on methodologies from laboratory experiments, evolutionary biology, computational phylogenetics, and evolutionary game theories.

Luc Steels (Universitat Pompeu Fabra), Freek van de Velde (University of Leuven) and Remi van Trijp (Song CSI Paris) organize the workshop on How Grammaticalization Processes Create Grammar: From Historical Corpus Data to Agent-based Models. This workshop, consisting of twenty talks and five posters, highlights that historical linguistics is not only relevant but indeed central to the research of language evolution, and that scientific modeling is not only possible but also highly insightful in many cases to our understanding of language evolution. The participants of the workshop report their research that quantitatively traces the grammaticalization processes in Chinese and Indo-European languages, simulates the origin of different types of grammatical structures in Indo-European languages, illustrates the impact of cognitive mechanisms underlying the emergence of grammar, such as recruitment, analogy, and learning biases, on the inference and rearrangement of new grammatical structures, and discusses how population structure influences the formation and change of pidgins and creoles. These many studies are based on a variety of methods, including corpus analysis, complex system and natural language processing techniques, and agent-based or neural modeling.

3. COMMENTS AND FUTURE DIRECTIONS

Four days of Evolang10 involve 145 talks and posters, which make it one of the biggest Evolang in the whole series. Based on the experiences of attending Evolang10 and past Evolang conferences, we would like to share three comments that we deem to be of special significance to the future research of language evolution. Through interactions with other participants, we find that some of these comments are also shared by other participants. Due to diverse backgrounds, other participants also have their perspectives on the future development of evolutionary linguistics, some of which are also shown in the conference proceedings (Cartmil et al. 2014).

(1) *Treatment to historical linguistics.* Historical linguistics, as the sole survival discipline to the 1866 ban, has been consistently blocked by Evolang ever since 1996. In the main conference of Evolang10, there are not many historical linguistics studies, except some corpus-based explorations, and many submissions on evolutions of particular languages have been rejected in the reviewing stage. This biased attitude causes historical and comparative linguistics to receive scant attention in the discussion of the origins and evolution of language in the Evolang forum.

Historical linguistics has been noted for its solid empirical basis. With recent development in corpus and quantitative linguistics, many corpora of world languages have become available, which record not only basic information (e.g., *Ethnologue*, Grimes 2000), cognates (e.g., *Austronesian Basic Vocabulary Database*, Greenhill and Gray 2008; *ASJP database*, Wichmann et al. 2013), or structural features of world languages (e.g., *World Atlas of Language Structures*, Dryer et al. 2013), but also representative expressions of these languages covering different historical periods (e.g., *Corpus of Historical American English*, Davies 2012). This rich amount of data has provided a repertoire for language evolution research, especially studies of cultural evolution of world languages, language change, contact, or competition (e.g., Sampson et al. 2009; Atkinson 2011; Dunn et al. 2011).

Due to the adoption of quantitative methods from evolutionary biology and bioinformatics, the centuries-old comparative approach in historical and comparative linguistics, which aims to identify and reconstruct the historical relations of world languages, has been greatly extended to estimate the time period of the initial Indo-European divergence (Gray and Atkinson 2003), to evaluate the competing hypotheses on the origins of Indo-European languages (Bouckaert et al. 2012), and to examine the deep relations of Eurasia language families based on the frequencies with which cognates are changing in modern languages (Pagel et al. 2007, 2013). These multi-disciplinary historical linguistic studies have brought forth more insightful understanding on the universality and diversity of world languages (Evans and Levinson 2009, Levinson and Gray 2012).

As advocated in Croft's keynote speech and many talks and posters in the workshops on Evolutionary Linguistics and Historical Language

Studies and How Grammaticalization Processes Create Grammar: From Historical Corpus Data to Agent-based Models, language change is an important component of language evolution. Many approaches, such as agent-based modeling, corpus analysis, and complex system techniques (e.g., Peng et al. 2008, Liang et al. 2014, Liu and Cong 2014), have enabled reliable studies to not only reveal and simulate various types of linguistic phenomena (e.g., grammaticalization), but also decipher cognitive mechanisms and socio-cultural factors underlying these evolutionary phenomena, all of which can contribute to comprehensive theories of language evolution and shed light on research in psychology, anthropology, sociology, and other sister disciplines.

Considering these, we believe that now it is time to lift the ban on historical linguistics, welcome back this important, yet long neglected discipline, and encourage more scientific and inter-disciplinary studies in this field.

(2) *Destine of modeling research and related human experiments.*

Unlike historical linguistics, computer simulation has always been a pop-star in Evolang. There are a large proportion of simulation studies in each Evolang. The academic careers of some famous modelers, such as Luc Steels, Bart de Boer, and Simon Kirby (University of Edinburgh), have roughly paralleled with Evolang. For example, starting from 1996, Kirby and colleagues have begun to develop the iterated learning paradigm, first in agent-based or mathematical models (Kirby 1996) and later (after 2006) in artificial language learning experiments or experimental semiotics studies (Galantucci and Garrod 2010), to address the origin of compositionality and systematicity in artificial languages. Also from 1996, Steels and colleagues have started to design agent-based models to simulate the origin of various grammatical structures via language games among robots or artificial agents (Steels 1999, 2011, 2012, 2013), and de Boer has started his agent-based model on the origin of vowel categories in artificial languages (de Boer 2001), and later shifted to experimental semiotics studies (e.g., Verhoef et al. 2014). Due to the influence of Evolang, many modeling and experimental studies on language evolution have been conducted to address a variety of topics about language evolution (cf. Perfors 2002; Wagner et al. 2003; Gong

2009; Gong and Shuai 2013; Gong, Shuai, and Wang 2013; Smith 2014).

Nonetheless, the modeling and robotic studies have shown a decline ever since Evolang9 in Kyoto. De Boer addresses this decline by pointing out three common pitfalls of modeling studies, including: the fact-free science not referring to outside phenomena; the cargo-cult science, an activity mimicking the procedures of science without delivering results; and the circularity when a model only explains the data used to build it (Coupé et al. 2013). Another challenge faced by many modeling and experimental semiotics studies following the iterated learning paradigm is that most of these studies only take into account artificial languages that exclude many linguistic structures, and therefore, these studies remain informative only at the stage of the origin of a compositional language out of a set of randomized signals.

The gap between real languages and artificial languages used or emerged in these models or experiments may render obvious misunderstanding on language evolution. For example, most modeling studies reviewed by Kenny Smith show that there is a drop in the degree of complexity (indicated by entropy and structuralness) during the origin of a compositional language out of randomized signals. Smith generalizes these findings and concludes that language tends to be simpler so as to be learned by speakers. However, in the first place, a compositional language is no doubt simpler and more informative than randomized signals, but we have no concrete evidence whether such randomized signals are the possible form of the protolanguage before a compositional language emerges. Second, in these models and experiments, especially those involving human subjects, other factors, such as memory, familiarity, or training effects, may play a role in reducing the complexity of artificial languages or other forms of communicative signals, yet the roles of these factors on language origins and evolution have not been systematically addressed (see Hurford's list of expected directions for future research of language evolution). Third, many of these studies simply follow the procedure of "first-learning-then-recalling", leaving out specific domains of language use. Following this procedure, simplified and structured signals are certainly preferred by artificial agents or human subjects. Without the need of putting these signals into actual use, oversimplification is inevitable. Finally, as explicitly shown in many

historical linguistics corpora, the cultural evolution of languages is no doubt a process of complexification. As also discussed in Senghas' keynote speech, the comparative evidence on successive cohorts of NSL users also reveals that via generations of language learning and use, NSL users have developed different types of linguistic constructions, which makes NSL more and more complex. Noting these, apart from purely simulations or simplified experiments on artificial languages, we need other approaches to better interpret the evolution of language.

The above discussion, however, does not mean that we should discard the modeling approach. Modeling is indispensable in exploring hypotheses on language evolution, especially those on language origins. Lacking time travel machines, we may never observe the origins of language, which has led some traditional linguists to argue that it is not worthwhile to discuss language origins. However, the same problem is also faced by scholars studying the origins of the Universe, and the modeling approach has served as a reliable approach therein to evaluate the "Big-Bang" or other theories on the origin of the Universe. In evolutionary linguistics, compared to other approaches, modeling helps narrow down the range of plausible hypotheses via setting accurate parameters and testing their implications, and reasonably recapitulated the million years of evolutionary process within a few hours of simulation time (Gong and Shuai 2013). Meanwhile, the modeling approach is also subject to critics of lacking founded assumptions and empirical tests, thus rendering unverifiable insights into language's origins and evolution (Pinker 1996, Hauser et al. 2014). To corroborate the foundations and authenticity of models, we need to not only verify model assumptions by referring to findings in related disciplines, such as psychology, neuroscience, or archaeology and anthropology, but also seek direct or indirect comparisons between the simulation results and the empirical data (Gong, Shuai, and Zhang 2014a, 2014b). In the latter aspect, de Boer suggests using the Newman-Pearson approach (Lehmann 1993) to test competing hypotheses of the same phenomena and tuning relevant model parameters to fit particular empirical data, and other scholars recommend using the Internet as a rich source of empirical data about the origins and the spread or change of linguistic structures (e.g., Cattuto et al. 2007, Tria et al. 2012). In addition, the modeling approach possesses a

cross-fertilization feature (Belew, Mitchell, and Ackley 1996), i.e., a computational framework that involves explicit assumptions and quantified parameters can be borrowed directly to efficiently address similar phenomena in other disciplines. Results of this framework can be exported from one field to another in a comprehensible manner, and results obtained in these similar fields can be mutually supportive to each other. In this sense, the authenticity of computer models of language origins can also be verified in other fields that involve phenomena that resemble language (e.g., physics, biology, etc.).

To maintain the prosperity of the modeling approach, modelers may need to divert their models in a number of new directions (Gong, Shuai, and Zhang 2014a, 2014b). For example, as advocated by Luc Steels, instead of looking at artificial languages or abstract universals like compositionality or systematicity, modeling studies should address specific linguistic systems, such as word orders (e.g., Gong 2011), color terms (e.g., Baronchelli et al. 2010), case markers, or morphological systems, and refer to real language data to verify their simulation results. Second, apart from language origin, modeling studies can also simulate language change (e.g., Ke et al. 2008; Blythe and Croft 2012; Gong et al. 2012), contact (e.g., Gong et al. 2008), or competition (e.g., Zhang and Gong 2013). The simulation results of these models can be directly compared with the empirical data. Finally, apart from language, modeling studies can also examine other facets of language evolution, such as the evolution of attention and memory (e.g., Gong and Shuai 2012) in Hurford's to-do list.

(3) *Necessity of pragmatics and neuroscience.* Despite other approaches, we also need to refer to pragmatics and neuroscience to better understand the acquisition and use of language during communications and the cognitive basis of relevant mechanisms enabling us to conduct linguistic communications and grasp exchanged language; yet these two fields have rarely been touched in the Evolang conferences.

On the one hand, Evolang has not invited any leading researchers in pragmatics, such as Stephen Levinson (Max Planck Institute for Psycholinguistics) or Dan Sperber (International Cognition and Culture Institute), for keynote speeches. However, recent research has revealed

the intricate connection between syntax and pragmatics (Christiansen and Chater 2008, Evans and Levinson 2009), the possible exaptation of recursion from mechanisms for processing pragmatic information and social relationships (recursive theory of mind) (Levinson 2013), and the importance of meta-representation competences (Sperber 2000) to intentional communications (Scott-Phillips et al. 2009). Comparative studies on a variety of nonhuman animals (e.g., dogs, Aust et al. 2008; putty-nosed monkeys, Arnold and Zuberbühler 2013; chimpanzees, Call 2006) also show that the pragmatic aspects of communication play a key role in integrating experiential or contextual information, and that preliminary causal understanding ability allows primitive versions of basic forms of inference at the nonlinguistic level with no requirement of deploying logical concepts (Zuberbühler 2013).

On the other hand, throughout the past Evolang conferences, except the keynote speeches of Michael Arbib in Evolang10 in Vienna, Terrence Deacon (University of California, Berkeley) in Evolang9 in Kyoto, and Friedemann Pulvermüller (Cambridge University) in Evolang7 in Barcelona, there were no other keynote speeches that systematically report neuroscience experiments, modeling, or findings relevant for language evolution. However, aided by modern neural imaging techniques, neuroscience research has made immense strides to advance our understanding on not only the neural bases of language and general cognition but also the evolutions of language-related processing mechanisms in the human brain and other ape brains (e.g., Brown and Hagoort 1999; Bolhuis et al. 2010; Arbib 2013; Andics et al. 2014). Many models, hypotheses, or theories of language processing and evolution have inevitably incorporated the biological and neural aspects of language (e.g., Deacon 1997; Dunbar 1998; Lieberman 2002; Schoenemann 2005; Okanoya 2007; Arbib 2012; Iriki and Taoka 2012). They tend to ascribe the uniqueness and evolution of language and related functions to specific neural foundations in the human brain (e.g., planum temporale, Gannon et al. 1998; dorsal-ventral speech perception pathways, Hickok and Poeppel 2000; arcuate fasciculus, Rilling et al. 2008; hemispheric specialization, Hopkins and Rilling 2000; Perani et al. 2011; Tzourio-Mazoyer and Courtin 2013; Shuai and Gong 2013, Shuai and Gong 2014), and these foundations have been widely discussed by neuroscientists and

psycholinguists (e.g., see Cook et al. 2014 for discussions on the roles of mirror neurons in cognition or language) in many other forums (e.g., Arbib, 2013; Lefebvre et al. 2013).

Noting these, we suggest that there is a necessity to incorporate more studies on pragmatics and neuroscience in Evolang in order to comprehensively discuss language evolution. Meanwhile, some popular approaches in evolutionary linguistics can also be adopted into pragmatics and neuroscience studies. For example, the complex network approaches have been used to study brain connectivity (e.g., Sporns 2012; Crossley et al. 2013), and the modeling approach has also been adopted to simulate the origin of communications (e.g., Scott-Phillip et al. 2012b). In other words, by joining the Evolang family, researchers in pragmatics and neuroscience can also benefit from discussions and collaborations with scholars in evolutionary linguistics.

4. EVOLUTIONARY LINGUISTICS IN CHINA

Modern evolutionary linguistics is a resurgent field (Cohen 2013). Chinese scholars actually stood at a similar or even an earlier starting point of this research, compared to Western scholars.

Back in 1978, William S-Y. Wang (王士元) (then in University of California, Berkeley, now in Chinese University of Hong Kong) have already given a series of theoretical discussions on the human capacity for language in his lecture series in Osmania University (Wang 1982a). He wisely points out that language can be regarded as a kind of “interface” among a variety of more basic abilities, some of which underlie nonlinguistic processes and involve the perception of patterns in the frequency and temporal domains, the coding and storage of events and objects at different levels of memory, and the manipulation of hierarchical mental structures. Second, he stresses that many of these basic abilities are present to different degrees in other animals and probably originated much earlier than language in the lineage of hominid evolution. These domain-general and non-human-unique perspectives on the Faculty of Language (FL) resemble and appear much earlier than the widely-discussed theory of the FL in the broad sense (FLB) (Hauser et al. 2002).. Third, he proposes the macro-, meso- and micro-history timescales to respectively record language origin, historical change, and

inter-generational cultural transmissions (Wang 1978), which correspond coherently to the phylogenetic, glossogenetic, and ontogenetic timescales widely used in Western literature (Fitch 2010). Fourth, he emphasizes the role of linguistic variation in language change (Wang 1982b), which also echoes Croft's framework of language change.

Apart from these theoretical discussions, starting from 2000, Wang and colleagues have conducted a series of lexical evolution models in China (Wang and Ke 2001), just a few years later than the similar work led by Hurford and Kirby from University of Edinburgh. The follow-up, agent-based and mathematical models have successfully simulated the process of lexical diffusion (Wang 1969), snow-ball effect during sound change, and bilingual-involved language competition (e.g., Wang et al. 2004; Minett and Wang 2008). Empirical data (e.g., Shen 1997) have provided concrete support for these modeling studies, and these studies have greatly contributed to the general discussions of language emergence, change and death (Wang and Minett 2005).

China possesses abundant linguistic resources, such as the lexical tones in Mandarin, Cantonese, and other dialects, rich minority languages exhibiting diverse linguistic features, complex mixing structures of ethnic groups speaking distinct languages (e.g., Wang 2003), various patterns of language contact and thus-induced pidgins or creoles (e.g., Atshogs 2005), to name just a few. Many unique and valuable contributions can be made based upon these resources, such as the network-based analysis of Chinese corpora (e.g., Liu and Cong 2014), description and comparison of endangered languages in China (e.g., Kong et al. 2011; Wang, F. 2012), decoding of neural activation patterns in lexical tone processing (e.g., Shuai and Gong 2014), analysis of contact patterns (e.g., Gong et al. 2013b) and their effects on emergent pidgins and creoles (e.g., Atshogs 2005), and simulations of the origins and evolution of constituent word orders (e.g., Gong 2009, 2011). In addition, Sinitic languages exhibit a number of characteristics distinct from Indo-European languages. Experimental and comparative studies recruiting speakers of Sinitic languages and those recruiting speaker of Indo-European languages are promising to bring forth new understanding about cognitive mechanisms underlying language acquisition and processing (e.g., Peng et al. 2010; Shuai et al. 2013; Lam and Gong 2014).

Now, thanks to the lecture series on Language, Evolution and Brain in Peking University in 2009 (Wang 2011), a number of general introductions of evolutionary linguistics to Chinese scholars (e.g., Gong Shuai and Ansaldo. 2011; Gong and Shuai 2012; Wang and Gong 2011b; Shuai and Gong 2013; Gong, Shuai, and Wang 2013), and the annual Conference in Evolutionary Linguistics (CIEL) (initiated by Wang in 2009, and now organized in chief by Feng Shi (石锋) from Nankai University), evolutionary linguistics research in China has undergone a stable growth, a number of influential research outputs (see those listed in the above paragraph) have been made, and a group of young scholars have been cultivated.

Nonetheless, there remain not many Chinese scholars in the international forum of Evolang. The first author Tao Gong started to attend Evolang in Leipzig in 2004 (Evolang5). As the only Chinese participant, he gave two talks in Evolang5. In the past ten years, he kept attending Evolang, giving two or three presentations each time and witnessing more and more participants from Asia, but mainly from Japan or India. In 2012, he gave an invited talk in Evolang9, and was excited to see some Chinese students in Kyoto, but most of them were helpers, not presenters. In Evolang10, we were glad to see six Chinese participants from Hong Kong, Mainland China, and overseas, who presented six talks and one poster in the main conference and pre-conference workshops. These presentations cover a variety of topics, including the network-based analysis of Chinese corpora from different historical periods (by Xinying Chen), artificial language learning experiments on Chinese participants (by Yau Wai Lam), mathematical modeling of language competition (by Menghan Zhang), artificial birdsong learning experiments (by Jiani Chen (陈嘉妮) from University of Leiden), discussion of the polygenesis hypothesis based on Neanderthals' language abilities (by Pui Yiu Szeto (司徒沛峯) from Chinese University of Hong Kong), evolutionary pressures on semantic frame structures and applications of natural language processing algorithms in music processing (by Dekai Wu (吴德愷) from Hong Kong University of Science and Technology).

In line with the flourishing development of evolutionary linguistics research in China, we would like to take this occasion to encourage more competent Chinese scholars to participate in Evolang11 in New Orleans,

USA in 2016 and present our multi-disciplinary, scientific contributions to the advancement of modern research in this booming field.

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评论

演化语言学在过去二十年之发展
第十届演化语言学国际会议纪要

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提要

本文通过综述第十届演化语言学国际会议的主题演讲和会前工作坊，总结了演化语言学在过去二十年间的蓬勃发展，并对此系列会议提出了三点建议，包括：1，反思对历史语言学研究的拒绝态度；2，未来模拟仿真研究向何处去；3，加入更多语用学和脑科学对语言演化研究的贡献。本文最后回顾中国学者对演化语言学的贡献，概述此项研究在中国学术界的发展现状，并指出中国丰富的语言演化研究资源和中国学者能够对此项研究做出贡献的方向。作者殷切希望更多中国学者能够加入此领域研究，并做出重要贡献。

主题词

演化语言学 模拟仿真 语用学 脑科学

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