

The evolution of language comes of age

W. Tecumseh Fitch

The Fourth International Conference on the Evolution of Language was held at Harvard University, Cambridge, MA, USA, on 27–30 March 2002.

Language is arguably the most important characteristic of our species, with no known analogs in the animal world. The evolution of language is one of the most intriguing events in the history of life on earth, and has justifiably been the topic of much speculation and debate. Unfortunately, because biologists have yet to identify plausible language precursors in our nearest primate relatives, hypotheses about how an ape-like prehuman acquired spoken language are relatively unconstrained by data. This has led to centuries of wild speculation about the origin of language, which prompted the Linguistic Society of Paris to ban all further discussion of the topic in 1866. Until recently, the evolution of language has remained a marginalized topic in both biology and linguistics, seeming to many scientists more fitting for after-dinner speculation than scholarly study. However, remarkable empirical advances in biology, neuroscience and linguistics have led to a rebirth of research on language evolution in the past decade. The field's bright future was heralded at this recent conference. Attended by 280 evolutionary biologists, linguists, neuroscientists, mathematicians and anthropologists, the conference featured over 80 presentations by researchers from around the world, and culminated in a historic round-table discussion bringing together recent progress in evolutionary biology and linguistics. The scientific study of the evolution of language has apparently come of age.

The study of language evolution is highly interdisciplinary, and has traditionally suffered from rampant miscommunication, polemics and accusations of mutual irrelevance. The Harvard conference was the fourth in a series (initiated in 1996 by linguist James Hurford at Edinburgh University, UK) that explicitly encourages an integrative, conciliatory approach

(particularly between Darwinian and Chomskian perspectives on language). At the Harvard conference, this encouragement was clearly in evidence: despite vigorous argument and occasional rhetorical pyrotechnics, the overall atmosphere was one of relaxed and fruitful interdisciplinary collaboration, synthesis over an ever-widening database, and tangible progress on the central issues of biolinguistics and language evolution.

Formalizing evolutionary hypotheses

An important advance in the field is an increasing use of mathematics to formalize evolutionary hypotheses and test their predictions. Such formalization has historically played a crucial role in physics, and more recently in neuroscience and evolutionary biology, but its introduction into biolinguistics is a new and welcome trend. The variety of approaches is impressive, ranging from evolutionary mathematics (Martin Nowak, Princeton, NJ, USA) to complex computer simulations (Ted Briscoe, Cambridge, UK). A consensus emerging from this work concerns the importance of historical language change (in the words and rules that constitute a spoken language) to the biological evolution of the language faculty. The primary linguistic data used by the child to discover its own idiosyncratic internal version of a language (termed I-language) has been 'filtered' by previous generations of learners. Through a process of competition and selection somewhat akin to natural selection, this socially shared database changes continually, such that useful units flourish but rarely used or difficult forms disappear. The study of such historical changes provides a window into the biological factors in language, which are the 'filters', these essentially unchanging at historical time scales. These observations also lessen the mystery of the prodigious ease with which children master language, because the data they get as input is in some sense 'predigested' and made more learnable by their parents and other prior learners with whom they come into contact.

Cross-fertilization

A second welcome trend seen at the conference was the growing incorporation of comparative data, after decades of neglect. A heavily attended session on animal communication reviewed natural communication in diverse vertebrates (birds, dolphins and primates), and analyzed data from artificial languages taught to chimpanzees and parrots. Many of these presentations stressed that, despite the uniqueness of human language as a whole, most of the component *mechanisms* underlying language do have homologs or analogs in other species. Such data will clearly play a crucial role in constraining theories of the phylogenetic origins of human language.

Perhaps the most encouraging development in the field is an increasing cross-fertilization between linguistics and biology. A day-long symposium on the costs of signaling featured evolutionary biologist Amotz Zahavi (Tel Aviv University, Israel), originator of the handicap principle, who discussed the implications of honest signaling theory for human language. Evolutionary biologists now recognize that the evolution of honest communication cannot be taken for granted, because the potential gains for deceivers pose a constant threat to honest communication systems. The remarkable capacity of human language to allow honest communication thus poses an important puzzle, which the participants of the symposium grappled with.

The implications of modern linguistics for biology were also made clear. Linguist Ray Jackendoff (Brandeis, Waltham, MA, USA) provided a penetrating analysis of linguistic phenomena in English that he argues represent 'linguistic fossils', which provide clues to brain mechanisms that supported earlier versions of the language faculty. The final event of the conference was a round-table discussion, featuring the founder of modern linguistics, Noam Chomsky (MIT, Cambridge, MA, USA), evolutionary biologist Marc Hauser (Harvard University, Cambridge, MA, USA) and speech scientist Michael Studdert-Kennedy (Haskins Laboratories, New Haven,

CT, USA). In his opening comments, Chomsky reiterated his commitment to a view of language as a biological capacity unique to the human species, a view that he has championed for half a century, and expressed a cautious optimism about the value of comparative work for understanding the nature of this mechanism. Hauser put forward the controversial hypothesis that no aspects of speech perception evolved specifically for speech, citing numerous studies revealing human-like speech-perception capacities in animals. Perhaps most surprisingly, Studdert-Kennedy (veteran researcher on speech perception), bemoaned the focus of speech research on perception and urged a closer focus on speech production.

These provocative introductory statements were followed by an hour of freewheeling, and often intentionally humorous, discussion, touching on topics

Key conference outcomes

- Mathematics and computer modeling will play an increasingly important role in the study of language evolution, paralleling their role in physics, evolutionary biology and neuroscience.
- Phylogenetic hypotheses about language origins will be increasingly informed and constrained by data from non-human animals, both in terms of their natural communication systems and their cognitive abilities.
- Interdisciplinary cross-fertilization and integration of data from diverse sources, particularly biology and linguistics but also neuroscience and anthropology, will continue to play a key role in theorizing about the evolution of language. For example, evolutionary biologist Mark Pagel (University of Reading, UK), applied phylogenetic tree-finding tools from molecular biology to the Indo-European language family. Using cognate words as the stand-in for DNA sequences, Pagel and collaborators have derived a family tree for Indo-European languages that fits previous hypotheses nicely, suggesting that the technique can be productively applied to lesser-known language groups.

as diverse as frog mating calls, the rate of speech relative to that of thought, the key role of imitation in language evolution, and sign-language poetry. Although this lively discussion raised many more issues than it resolved, it provided a fittingly broad and good-natured end to the conference. Overall, the success of this

Harvard conference suggests a highly promising future for the study of language evolution.

W. Tecumseh Fitch

Dept of Psychology, Harvard University,
33 Kirkland St, Cambridge, MA 02138, USA.
e-mail: tec@wjh.harvard.edu



Editor's choice bmn.com/neuroscience

As a busy cognitive scientist, searching through the wealth of information on BioMedNet can be a bit daunting - the new gateway to neuroscience on BioMedNet is designed to help.

The new gateway is updated weekly and features relevant articles selected by the editorial teams from *Trends in Neuroscience*, *Current Opinion in Neurobiology* and *Trends in Cognitive Sciences*.

The regular updates include:

News – our dedicated team of reporters from BioMedNet News provides all the news to keep you up-to-date on what's happening – right now.

Journal scan – learn about new reports and events in neuroscience every day, at a glance, without leafing through stacks of journals.

Conference reporter – daily updates on the most exciting developments revealed at the Annual meeting for the Society for Neuroscience and other conferences – provides a quick but comprehensive report of what you missed by staying home.

Mini-reviews and Reviews – a selection of the best review and opinion articles from the Trends, Current Opinion, and other selected journals.

Why not bookmark the gateway at bmn.com/neuroscience for access to all the news, reviews and informed opinion on the latest scientific advances in **neuroscience**.