

Letter From the Desk of David Challinor
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In last December's letter I speculated how and when mankind might have become human. The answer to this perplexing question is elusive, but recent linguistic research has introduced some tantalizing clues to the origin of our humanness. This letter will consider how our acquisition of language paralleled our gaining self-consciousness, two qualities that together seem to separate us from other mammals. According to this theory, possession of language empowered us to adapt the world to fit our needs, rather than the reverse, under which all the rest of life operates. At first glance the awesome power language has given us may seem farfetched, but I hope to show that this power is real and, surprisingly, might even be maladaptive.

Language is a system of sorting information, not just a means of communication. Most if not all animals can communicate, but so far no connection has been shown between animal communication and language. The unit of sound animals use to communicate is not specific and fails to sort information. Thus a vervet monkey's alarm call for a snake it sees gives no details on its size or the danger it poses. Language, however, allows one to describe anything, even things that do not actually exist, e.g. a centaur. Furthermore, humans do not have to learn consciously how to speak; we are hardwired for crucial aspects of language, even using it unconsciously in our dreams. When Noam Chomsky first broached his theory 30 years ago that the human brain was genetically programmed for syntax, his supposition met with skepticism. He was trying to explain how two-year-olds spoke so quickly and accurately. Although his theory is still debated, two papers given at the AAAS meeting last January, one by Guglielmo Cinque from the University of Venice and another by MIT professor of linguistics David Pesetsky, maintained that humans have an innate set of rules for grammar.

Despite intensive efforts by psychologists to teach chimpanzees to "speak" to us, they cannot. They can, however, communicate and even be taught to distinguish between proper and common nouns, but they have yet to be trained to produce a single sentence with syntax. Even Nim, the famous signing chimpanzee, could give 16 continuous signs (words) but without any grammatical structure. Only humans can transmit an unambiguous description of who did what to whom; however, there are some crucial conditions. Adults must talk to children and the child must hear what is said. Between one and one-and-a-half years old, children's neurons will have developed enough so that they mimic words. By about two they can speak simple sentences, generally with the proper word order of their cultural language. The speech of children between one and two is probably similar to that spoken by our early ancestors from a few hundred thousand years ago, until about 40 or 50,000 years ago when the brain could process speech into language.

The importance of hearing conversation or being talked to during the critical period of a child's development became evident in 1970 in California when a 13-year-old girl was found wandering in the streets with her mother. They had escaped from her father who had kept her alone in a locked bedroom since she was 1-1/2. After hospitalization, the doctors discovered she could not talk properly. Although she eventually recovered both physically and mentally, and great effort was made to teach her language, she was never able to speak properly and could not exceed the speaking ability of a 1-1/2 year old. Her short sentences were ambiguous because they lacked syntax. She seemed to be speaking a protolanguage described by Bickerton* as a form of speaking that contains primitive components of true language, but lacks its formal and easily recognizable properties. Her limited ability seems to indicate that protolanguage (that spoken by a 1-1/2 year old or a trained signing ape) is indeed part of our programmed ability for language and although older than "true" language and thus part of our ancient genetic heritage, is not fully hardwired or innate. Thus the properties of protolanguage and language are quite separate and acquiring one does not necessarily allow the acquisition of the other. This girl was stuck in the protolanguage stage of normal development because her isolation during a critical time prevented the neural development that normally would have progressed from about the age of two and beyond.

An opportunity to study such an exceptional child is rare, and a sample of one is clearly too small to show conclusively why she could speak only a protolanguage. A better example of language evolution might be the almost spontaneous speaking of pidgin languages that happens when a group of people talking different languages are unexpectedly forced to live and work together. The group soon borrows words from each other to communicate. Eventually they talk in short strings of words rich in meaning but without articles, prepositions or tense. Their speech thus has elements of a protolanguage. If the first generation of pidgin speakers stays intact, their children will refine the pidgin as they learn to talk so that the second generation will speak a Creole language, which becomes one as "true" as English or French, and will include its own literature.

The examples above illustrate ways in which language develops among humans today. Other evidence can be gleaned from the fossil record. Tree-dwelling apes need stereoscopic vision to judge distance accurately when jumping from branch to branch. Such visual processing requires complex neural connections that in the dim past may have increased brain size relative to other mammals. When our ape ancestors moved to the ground, they retained their stereoscopic vision and also became bipedal, thereby freeing their prehensile hands to exploit their new savanna habitat. As they wandered the plains to find food and water, their memories and strategies for survival could have led to increased neural development. Thus both the growth of neural complexity and the lowering of the larynx in the throat prepared the way for the ability to speak.

The early hominids had advantages other than brain power over their competitors. They could run down animals as well as track potential prey. Their prehensile hands let them use sticks and stones as weapons or for cracking nuts and bones for food. As they spread out to travel across the savanna, they must have had to communicate with each other, probably by calls or whistles. Until language developed, however, early hominids were but one of many mammals competing for earth's resources. It was not until humans mastered language that their ascendancy over all other creatures could begin. With language they could communicate their thoughts and cooperatively plan future actions.

Because human ascendancy developed so rapidly, it seems likely that language did too. The quick manner in which children talk supports this idea. Language could conceivably have developed as a result of mutation in a single individual. A single mutation rarely survives unless the population in which it appears has already evolved to exploit the mutation. This may have been the case with H. sapiens, which probably had a protolanguage (without syntax and a limited lexicon) but possessed a potential brain capacity to handle syntax and a larynx low enough in the throat to speak. If a mutation in an individual indeed triggered our ability to possess language (and thus be human?), it might add a new perspective on the portrayal of God and Adam on the ceiling of the Sistine Chapel. Adam, or perhaps Eve, may have been the first person to have this mutation!

How did this extraordinary ability to master language spread so fast? One theory is that the progeny of the individual possessing the first language mutation all inherited it. The advantages were enormous and, given what we know of human behavior today, possessors of this mutated gene could spread it by dominating the breeding population, wiping out competing hominids who lacked language, or forcing them into less favorable niches in which they disappeared in a few generations. An example might be the displacement of the Neanderthals by H. sapiens some 40,000 years ago. The former were well adapted to living in glaciated Europe; they actually had larger brains than the migrants from the south. Yet the fossil evidence shows that the two hominid species overlapped for only 10,000 years before the Neanderthals disappeared. One cause for their demise could be the advantage of true language held by H. sapiens.

If we believe one cannot think without language, the possession of language may have allowed thinking. What happens in our minds is unknown to all others. Einstein is said to have thought in images rather than language, but wouldn't one need language to relate images to another? We may never have a definitive answer, but we do know that language capability is located in the left half of the brain and that language and consciousness are inextricably connected. We are conscious of what we can process linguistically. More complicated still is the relationship between language and the talent to create music and art.

When humans began to settle in agricultural communities about 10,000 years ago, they became more territorial and hierarchical. Power began to reside in the office of the community's governing body rather than being determined by the qualities of the office holder. Language allowed concentrated human populations to organize and develop technology that in turn fostered planned social inequality. When such inequality became intolerable to the exploited, it led to violence, so that today nationally and ethnically sponsored violence results in war.

Can language in the long run be maladaptive? Today humans control the world socially and politically and to a lesser extent physically. Occasional earthquakes, floods and volcanic eruptions temporarily encroach on our efforts to achieve physical control, but scattered natural disasters have little long-term effect on the total human population. Although we have almost adapted the world to our insatiable needs, we still must face the reality that the more we take from the earth for our own use, the more we may eventually have to return. We behave occasionally in an almost antibiological fashion, e.g. individual suicides or when a hierarchically controlled group of people kill themselves en masse. Such shocking events illustrate the power of language to unite whole nations which attempt to exterminate their enemies. Humans already have the nuclear capability to destroy the world, but still seem incapable of significantly reducing nuclear stockpiles. Could it be that we have yet to hear a reply to our search for intelligent life in outer space because possession of language is antithetical to long-term survival?

Be assured that I do not subscribe to such thinking, but I am an incurable optimist who believes that language is a divine gift, available for great good to our planet as well as for its destructive powers. We have a serious responsibility not yet acted upon to protect our planet for future generations.

David Challinor
Phone: 202-673-4705
Fax: 202-673-4607
E-mail: ChallinorD@aol.com

*Derek Bickerton, Language and Species, Univ. of Chicago Press, 1990 – an excellent source for additional information and for the background of this letter.