

New York Times . Early Voices: The Leap to Language July 15, 2003 by Nicholas Wade, F1.

Bower birds are artists, leaf-cutting ants practice agriculture, crows use tools, chimpanzees form coalitions against rivals. The only major talent unique to humans is language, the ability to transmit encoded thoughts from the mind of one individual to another. Because of language's central role in human nature and sociality, its evolutionary origins have long been of interest to almost everyone, with the curious exception of linguists. As far back as 1866, the Linguistic Society of Paris famously declared that it wanted no more speculative articles about the origin of language.

More recently, many linguists have avoided the subject because of the influence of Noam Chomsky, a founder of modern linguistics and still its best-known practitioner, who has been largely silent on the question. Dr. Chomsky's position has "only served to discourage interest in the topic among theoretical linguists," writes Dr. Frederick J. Newmeyer, last year's president of the Linguistic Society of America, in "Language Evolution," a book of essays being published this month by Oxford University Press in England.

In defense of the linguists' tepid interest, there have until recently been few firm facts to go on. Experts offered conflicting views on whether Neanderthals could speak. Sustained attempts to teach apes language generated more controversy than illumination. But new research is eroding the idea that the origins of language are hopelessly lost in the mists of time. New clues have started to emerge from archaeology, genetics and human behavioral ecology, and even linguists have grudgingly begun to join in the discussion before other specialists eat their lunch.

"It is important for linguists to participate in the conversation, if only to maintain a position in this intellectual niche that is of such commanding interest to the larger scientific public," writes Dr. Ray Jackendoff, Dr. Newmeyer's successor at the linguistic society, in his book "Foundations of Language."

Geneticists reported in March that the earliest known split between any two human populations occurred between the !Kung of southern Africa and the Hadza of Tanzania. Since both of these very ancient populations speak click languages, clicks may have been used in the language of the ancestral human population. The clicks, made by sucking the tongue down from the roof of the mouth (and denoted by an exclamation point), serve the same role as consonants.

That possible hint of the first human tongue may be echoed in the archaeological record. Humans whose skeletons look just like those of today were widespread in Africa by 100,000 years ago. But they still used the same set of crude stone tools as their forebears and their archaic human contemporaries, the Neanderthals of Europe.

Then, some 50,000 years ago, some profound change took place. Settlements in Africa sprang to life with sophisticated tools made from stone and bone, art objects and signs of long distance trade.

Though some archaeologists dispute the suddenness of the transition, Dr. Richard Klein of Stanford argues that the suite of innovations reflects some specific neural change that occurred around that time and, because of the advantage it conferred, spread rapidly through the population.

That genetic change, he suggests, was of such a magnitude that most likely it had to do with language, and was perhaps the final step in its evolution. If some neural change explains the appearance of fully modern human behavior some 50,000 years ago, "it is surely reasonable to suppose that the change promoted the fully modern capacity for rapidly spoken phonemic speech," Dr. Klein has written.

Listening to Primates: Apes' Signals Fall Short of Language

At first glance, language seems to have appeared from nowhere, since no other species speaks. But other animals do communicate. Vervet monkeys have specific alarm calls for their principal predators, like eagles, leopards, snakes and baboons.

Researchers have played back recordings of these calls when no predators were around and found that the vervets would scan the sky in response to the eagle call, leap into trees at the leopard call and look for snakes in the ground cover at the snake call.

Vervets can't be said to have words for these predators because the calls are used only as alarms; a vervet can't use its baboon call to ask if anyone noticed a baboon around yesterday. Still, their communication system shows that they can both utter and perceive specific sounds.

Dr. Marc Hauser, a psychologist at Harvard who studies animal communication, believes that basic systems for both the perception and generation of sounds are present in other animals. "That suggests those systems were used way before language and therefore did not evolve for language, even though they are used in language," he said.

Language, as linguists see it, is more than input and output, the heard word and the spoken. It's not even dependent on speech, since its output can be entirely in gestures, as in American Sign Language. The essence of language is words and syntax, each generated by a combinatorial system in the brain.

If there were a single sound for each word, vocabulary would be limited to the number of sounds, probably fewer than 1,000, that could be distinguished from one another. But by generating combinations of arbitrary sound units, a copious number of distinguishable sounds becomes available. Even the average high school student has a vocabulary of 60,000 words.

The other combinatorial system is syntax, the hierarchical ordering of words in a sentence to govern their meaning.

Chimpanzees do not seem to possess either of these systems. They can learn a certain number of symbols, up to 400 or so, and will string them together, but rarely in a way that suggests any notion of syntax. This is not because of any poverty of thought. Their conceptual world seems to overlap to some extent with that of people: they can recognize other individuals in their community and keep track of who is dominant to whom. But they lack the system for encoding these thoughts in language.

How then did the encoding system evolve in the human descendants of the common ancestor of chimps and people?

Language Precursors: Babbling and Pidgins Hint at First Tongue

One of the first linguists to tackle this question was Dr. Derek Bickerton of the University of Hawaii. His specialty is the study of pidgins, which are simple phrase languages made up from scratch by children or adults who have no language in common, and of creoles, the successor languages that acquire inflection and syntax.

Dr. Bickerton developed the idea that a proto-language must have preceded the full-fledged syntax of today's discourse. Echoes of this proto-language can be seen, he argued, in pidgins, in the first words of infants, in the symbols used by trained chimpanzees and in the syntax-free utterances of children who do not learn to speak at the normal age.

In a series of articles, Dr. Bickerton has argued that humans may have been speaking proto-language, essentially the use of words without syntax, as long as two million years ago. Modern language developed more recently, he suggests, perhaps with appearance of anatomically modern humans some 120,000 years ago.

The impetus for the evolution of language, he believes, occurred when human ancestors left the security of the forest and started foraging on the savanna. "The need to pass on information was the driving force," he said in an interview.

Foragers would have had to report back to others what they had found. Once they had developed symbols that could be used free of context -- a general word for elephant, not a vervet-style alarm call of "An elephant is attacking!" -- early people would have taken the first step toward proto-language. "Once you got it going, there is no way of stopping it," Dr. Bickerton said.

But was the first communicated symbol a word or a gesture? Though language and speech are sometimes thought of as the same thing, language is a coding system and speech just its main channel.

Dr. Michael Corballis, a psychologist at the University of Auckland in New Zealand, believes the gesture came first, in fact as soon as our ancestors started to walk on two legs and freed the hands for making signs.

Chimpanzees have at least 30 different gestures, mostly used to refer to other individuals.

Hand gestures are still an expressive part of human communication, Dr. Corballis notes, so much so that people even gesticulate while on the telephone.

He believes that spoken words did not predominate over signed ones until the last 100,000 years or so, when a genetic change may have perfected human speech and led to its becoming a separate system, not just a grunted accompaniment for gestures.

Critics of Dr. Corballis's idea say gestures are too limited; they don't work in the dark, for one thing. But many concede the two systems may both have played some role in the emergence of language.

Search for Incentives: As Societies Grew The Glue Was Gossip

Dr. Bickerton's idea that language must have had an evolutionary history prompted other specialists to wonder about the selective pressure, or evolutionary driving force, behind the rapid emergence of language.

In the mere six million years since chimps and humans shared a common ancestor, this highly complex faculty has suddenly emerged in the hominid line alone, along with all the brain circuits necessary to map an extremely rapid stream of sound into meaning, meaning into words and syntax, and intended sentence into expressed utterance.

It is easy to see in a general way that each genetic innovation, whether in understanding or in expressing language, might create such an advantage for its owners as to spread rapidly through a small population.

"No one will take any notice of the guy who says 'Gu-gu-gu'; the one with the quick tongue will get the mates," Dr. Bickerton said. But what initiated this self-sustaining process?

Besides Dr. Bickerton's suggestion of the transition to a foraging lifestyle, another idea is that of social grooming, which has been carefully worked out by Dr. Robin Dunbar, an evolutionary psychologist at the University of Liverpool in England.

Dr. Dunbar notes that social animals like monkeys spend an inordinate amount of time grooming one another. The purpose is not just to remove fleas but also to cement social relationships. But as the size of a group increases, there is not time for an individual to groom everyone.

Language evolved, Dr. Dunbar believes, as a better way of gluing a larger community together.

Some 63 percent of human conversation, according to his measurements, is indeed devoted to matters of social interaction, largely gossip, not to the exchange of technical information, Dr. Bickerton's proposed incentive for language.

Dr. Steven Pinker of the Massachusetts Institute of Technology, one of the first linguists to acknowledge that language may be subject to natural selection, disputes Dr. Dunbar's emphasis on social bonding; a fixed set of greetings would suffice, in his view.

Dr. Pinker said it was just as likely that language drove sociality: it was because people could exchange information that it became more worthwhile to hang out together.

"Three key features of the distinctively human lifestyle -- know-how, sociality and language -- co-evolved, each constituting a selection pressure for the others," Dr. Pinker writes in "Language Evolution," the new book of essays.

But sociality, from Dr. Dunbar's perspective, helps explain another feature of language: its extreme corruptibility. To convey information, a stable system might seem most efficient, and surely not beyond nature's ability to devise. But dialects change from one village to another, and languages shift each generation.

The reason, Dr. Dunbar suggests, is that language also operates as a badge to differentiate the in-group from outsiders; thus the Gileadites could pick out and slaughter any Ephraimite asked to say "shibboleth" because, so the writer of Judges reports, "He said shibboleth: for he could not frame to pronounce it right."

Language in the Genome: From Family Failing First Gene Emerges

A new approach to the evolution of language seems to have been opened with studies of a three-generation London family known as KE. Of its 29 members old enough to be tested, 14 have a distinctive difficulty with communication. They have trouble pronouncing words properly, speaking grammatically and making certain fine movements of the lips and tongue.

Asked to repeat a nonsense phrase like "pataca pataca pataca," they trip over each component as if there were three different words.

Some linguists have argued that the KE family's disorder has nothing specific to do with language and is some problem that affects the whole brain. But the I.Q. scores of affected and unaffected members overlap, suggesting the language systems are specifically at fault. Other linguists have said the problem is just to do with control of speech. But affected members have problems writing as well as speaking.

The pattern of inheritance suggested that a single defective gene was at work, even though it seemed strange that a single gene could have such a broad effect. Two years ago, Dr. Simon Fisher and Prof. Tony Monaco, geneticists at the University of Oxford in England, discovered the specific gene that is changed in the KE family. Called FOXP2, its role is to switch on other genes, explaining at once how it may have a range of effects. FOXP2 is active in specific regions of the brain during fetal development.

The gene's importance in human evolution was underlined by Dr. Svante Paabo and colleagues at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. In a study last year they reported that FOXP2 is highly conserved in evolution -- in other words, that the precise sequence of units in FOXP2's protein product is so important that any change is likely to lead to its owner's death.

In the 70 million years since people and mice shared a common ancestor, there have been just three changes in the FOXP2 protein's 715 units, Dr. Paabo reported. But two of those changes occurred in the last six million years, the time since humans and chimps parted company, suggesting that changes in FOXP2 have played some important role in human evolution.

Sampling the DNA of people around the world, Dr. Paabo found signs of what geneticists call a selective sweep, meaning that the changed version of FOXP2 had spread through the human population, presumably because of some enormous advantage it conferred.

That advantage may have been the perfection of speech and language, from a barely comprehensible form like that spoken by the affected KE family members to the rapid articulation of ordinary discourse. It seems to have taken place about 100,000 years ago, Dr. Paabo wrote, before modern humans spread out of Africa, and is "compatible with a model in which the expansion of modern humans was driven by the appearance of a more proficient spoken language."

FOXP2 gives geneticists what seems to be a powerful entry point into the genetic and neural basis for language. By working out what other genes it interacts with, and the neural systems that these genes control, researchers hope to map much of the circuitry involved in language systems.

Ending the Silence: Linguists Return To Ideas of Origins

The crescendo of work by other specialists on language evolution has at last provoked linguists' attention, including that of Dr. Chomsky. Having posited in the early 1970's that the ability to learn the rules of grammar is innate, a proposition fiercely contested by other linguists, Dr. Chomsky might be expected to have shown keen interest in how that innateness evolved. But he has said very little on the subject, a silence that others have interpreted as disdain.

As Dr. Jackendoff, the president of the Linguistic Society of America, writes: "Opponents of Universal Grammar argue that there couldn't be such a thing as Universal Grammar because there is no evolutionary route to arrive at it. Chomsky, in reply, has tended to deny the value of evolutionary argumentation."

But Dr. Chomsky has recently taken a keen interest in the work by Dr. Hauser and his colleague Dr. W. Tecumseh Fitch on communication in animals. Last year the three wrote an article in *Science* putting forward a set of propositions about the way that language evolved. Based on experimental work by Dr. Hauser and Dr. Fitch, they argue that sound perception and production can be seen in other animals, though they may have been tweaked a little in hominids.

A central element in language is what linguists call recursion, the mind's ability to bud one phrase off another into the syntax of an elaborate sentence. Though recursion is not seen in animals, it could have developed, the authors say, from some other brain system, like the one animals use for navigation.

Constructing a sentence, and going from A to Z through a series of landmarks, could involve a similar series of neural computations. If by some mutation a spare navigation module developed in the brain, it would have been free to take on other functions, like the generation of syntax. "If that piece got integrated with the rest of the cognitive machinery, you are done, you get music, morality, language," Dr. Hauser said.

The researchers contend that many components of the language faculty exist in other animals and evolved for other reasons, and that it was only in humans that they all were linked. This idea suggests that animals may have more to teach about language than many researchers believe, but it also sounds like a criticism of evolutionary psychologists like Dr. Pinker and Dr. Dunbar, who seek to explain language as a faculty forced into being by specifics of the human lifestyle.

Dr. Chomsky rejects the notion that he has discouraged study of the evolution of language, saying his views on the subject have been widely misinterpreted.

"I have never expressed the slightest objection to work on the evolution of language," he said in an e-mail message. He outlined his views briefly in lectures 25 years ago but left the subject hanging, he said, because not enough was understood. He still believes that it is easy to make up all sorts of situations to explain the evolution of language but hard to determine which ones, if any, make sense.

But because of the importance he attaches to the subject, he returned to it recently in the article with Dr. Hauser and Dr. Fitch. By combining work on speech perception and speech production with a study of the recursive procedure that links them, "the speculations can be turned into a substantive research program," Dr. Chomsky said.

Others see Dr. Chomsky's long silence on evolution as more consequential than he does. "The fact is that Chomsky has had, and continues to have, an outsize influence in linguistics," Dr. Pinker said in an e-mail message. Calling Dr. Chomsky both "undeniably, a brilliant thinker" and "a brilliant debating tactician, who can twist anything to his advantage," Dr. Pinker noted that Dr. Chomsky "has rabid devotees, who hang on his every footnote, and sworn enemies, who say black whenever he says white."

"That doesn't leave much space," Dr. Pinker went on, "for linguists who accept some of his ideas (language as a mental, combinatorial, complex, partly innate system) but not others, like his hostility to evolution or any other explanation of language in terms of its function."

Biologists and linguists have long inhabited different worlds, with linguists taking little interest in evolution, the guiding theory of all biology. But the faculty for language, along with the evidence of how it evolved, is written somewhere in the now decoded human genome, waiting for biologists and linguists to identify the genetic program that generates words and syntax.