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Deciphering the Chatter of Monkeys and Chimps

By [NICHOLAS WADE](#)

Walking through the Tai forest of Ivory Coast, Klaus Zuberbühler could hear the calls of the Diana monkeys, but the babble held no meaning for him.

That was in 1990. Today, after nearly 20 years of studying animal communication, he can translate the forest's sounds. This call means a [Diana monkey](#) has seen a leopard. That one means it has sighted another predator, the crowned eagle. "In our experience time and again, it's a humbling experience to realize there is so much more information being passed in ways which hadn't been noticed before," said Dr. Zuberbühler, a psychologist at the University of St. Andrews in Scotland.

Do apes and monkeys have a secret language that has not yet been decrypted? And if so, will it resolve the mystery of how the human faculty for language evolved? Biologists have approached the issue in two ways, by trying to teach human language to chimpanzees and other species, and by listening to animals in the wild.

The first approach has been propelled by people's intense desire — perhaps reinforced by childhood exposure to the loquacious animals in cartoons — to communicate with other species. Scientists have invested enormous effort in teaching chimpanzees language, whether in the form of speech or signs. A New York Times reporter who understands sign language, Boyce Rensberger, was able in 1974 to conduct what may be the first newspaper interview with another species when he conversed with Lucy, a signing chimp. She invited him up her tree, a proposal he declined, said Mr. Rensberger, who is now at [M.I.T.](#)

But with a few exceptions, teaching animals human language has proved to be a dead end. They should speak, perhaps, but they do not. They can communicate very expressively — think how definitely dogs can make their desires known — but they do not link symbolic sounds together in sentences or have anything close to language.

Better insights have come from listening to the sounds made by animals in the wild. [Vervet monkeys](#) were found in 1980 to have specific alarm calls for their most serious predators. If the calls were recorded and played back to them, the monkeys would respond appropriately. They jumped into bushes on hearing the leopard call, scanned the ground at the snake call, and looked up when played the eagle call.

It is tempting to think of the vervet calls as words for “leopard,” “snake” or “eagle,” but that is not really so. The vervets do not combine the calls with other sounds to make new meanings. They do not modulate them, so far as is known, to convey that a leopard is 10, or 100, feet away. Their alarm calls seem less like words and more like a person saying “Ouch!” — a vocal representation of an inner mental state rather than an attempt to convey exact information.

But the calls do have specific meaning, which is a start. And the biologists who analyzed the vervet calls, Robert Seyfarth and Dorothy Cheney of the [University of Pennsylvania](#), detected another significant element in primates’ communication when they moved on to study [baboons](#). Baboons are very sensitive to who stands where in their society’s hierarchy. If played a recording of a superior baboon threatening an inferior, and the latter screaming in terror, baboons will pay no attention — this is business as usual in baboon affairs. But when researchers concoct a recording in which an inferior’s threat grunt precedes a superior’s scream, baboons will look in amazement toward the loudspeaker broadcasting this apparent revolution in their social order.

Baboons evidently recognize the order in which two sounds are heard, and attach different meanings to each sequence. They and other species thus seem much closer to people in their understanding of sound sequences than in their production of them. “The ability to think in sentences does not lead them to speak in sentences,” Drs. Seyfarth and Cheney wrote in their book “Baboon Metaphysics.”

Some species may be able to produce sounds in ways that are a step or two closer to human language. Dr. Zuberbühler reported last month that [Campbell’s monkeys, which live in the forests of the Ivory Coast, can vary individual calls by adding suffixes](#), just as a speaker of English changes a verb’s present tense to past by adding an “-ed.”

The Campbell’s monkeys give a “krak” alarm call when they see a leopard. But adding an “-oo” changes it to a generic warning of predators. One context for the krak-oo sound is when they hear the leopard alarm calls of another species, the Diana monkey. The Campbell’s monkeys would evidently make good reporters since they distinguish between leopards they have observed directly (krak) and those they have heard others observe (krak-oo).

Even more remarkably, the Campbell’s monkeys can combine two calls to generate a third with a different meaning. The males have a “Boom boom” call, which means “I’m here, come to me.” When booms are followed by a series of krak-ooos, the meaning is quite different, Dr. Zuberbühler says. The sequence means “Timber! Falling tree!”

Dr. Zuberbühler has observed a similar achievement among putty-nosed monkeys that combine their “pyow” call (warning of a leopard) with their “hack” call (warning of a crowned eagle) into a sequence that means “Let’s get out of here in a real hurry.”

Apes have larger brains than monkeys and might be expected to produce more calls. But if there is an elaborate code of chimpanzee communication, their human cousins have not yet cracked it. Chimps

make a food call that seems to have a lot of variation, perhaps depending on the perceived quality of the food. How many different meanings can the call assume? “You would need the animals themselves to decide how many meaningful calls they can discriminate,” Dr. Zuberbühler said. Such a project, he estimates, could take a lifetime of research.

Monkeys and apes possess many of the faculties that underlie language. They hear and interpret sequences of sounds much like people do. They have good control over their vocal tract and could produce much the same range of sounds as humans. But they cannot bring it all together.

This is particularly surprising because language is so useful to a social species. Once the infrastructure of language is in place, as is almost the case with monkeys and apes, the faculty might be expected to develop very quickly by evolutionary standards. Yet monkeys have been around for 30 million years without saying a single sentence. Chimps, too, have nothing resembling language, though they shared a common ancestor with humans just five million years ago. What is it that has kept all other primates locked in the prison of their own thoughts?

Drs. Seyfarth and Cheney believe that one reason may be that they lack a “theory of mind”; the recognition that others have thoughts. Since a baboon does not know or worry about what another baboon knows, it has no urge to share its knowledge. Dr. Zuberbühler stresses an intention to communicate as the missing factor. Children from the youngest ages have a great desire to share information with others, even though they gain no immediate benefit in doing so. Not so with other primates.

“In principle, a chimp could produce all the sounds a human produces, but they don’t do so because there has been no evolutionary pressure in this direction,” Dr. Zuberbühler said. “There is nothing to talk about for a chimp because he has no interest in talking about it.” At some point in human evolution, on the other hand, people developed the desire to share thoughts, Dr. Zuberbühler notes. Luckily for them, all the underlying systems of perceiving and producing sounds were already in place as part of the primate heritage, and natural selection had only to find a way of connecting these systems with thought.

Yet it is this step that seems the most mysterious of all. Marc D. Hauser, an expert on animal communication at [Harvard](#), sees the uninhibited interaction between different neural systems as critical to the development of language. “For whatever reason, maybe accident, our brains are promiscuous in a way that animal brains are not, and once this emerges it’s explosive,” he said.

In animal brains, by contrast, each neural system seems to be locked in place and cannot interact freely with others. “Chimps have tons to say but can’t say it,” Dr. Hauser said. Chimpanzees can read each other’s goals and intentions, and do lots of political strategizing, for which language would be very useful. But the neural systems that compute these complex social interactions have not been married to language.

Dr. Hauser is trying to find out whether animals can appreciate some of the critical aspects of language, even if they cannot produce it. He and Ansgar Endress reported last year that cotton-top tamarins can distinguish a word added in front of another word from the same word added at the end. This may seem like the syntactical ability to recognize a suffix or prefix, but Dr. Hauser thinks it is just the ability to recognize when one thing comes before another and has little to do with real syntax.

“I’m becoming pessimistic,” he said of the efforts to explore whether animals have a form of language. “I conclude that the methods we have are just impoverished and won’t get us to where we want to be as far as demonstrating anything like semantics or syntax.”

Yet, as is evident from Dr. Zuberbühler’s research, there are many seemingly meaningless sounds in the forest that convey information in ways perhaps akin to language.

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