A Telling Difference

Animals can communicate, but evidence that any of them can emulate human language remains elusive.

By Stephen R. Anderson

Doctor Dolittle, the fictional hero of Hugh Lofting’s novels, was said to be able to talk with animals. Whether he, or any of his would-be imitators in real life today, could actually speak with an animal is an entirely different question.

Clearly animals can communicate; communication is virtually universal among living things. Cats meow; songbirds sing; whales call. A dog wagging its tail can be providing information about how it feels and what it wants. Surely, though, such communication is not of a piece with the languages people use. Describing any of those behaviors with the word “talk” would be nothing more than a (feeble) attempt to be clever.

But people do use words such as “talk” to describe certain kinds of animal communication. In fact, since the 1970s many claims have been made about the potential abilities of apes to talk with people in sign languages or via other means. What is the nonspecialist to make of such claims? Are animals simply handicapped by their vocal anatomy? Could they, like Dr. Dolittle’s friends, one day be taught to converse with us, via some vocal or non-vocal channel, and perhaps even to pass along their newly acquired linguistic “culture” to their offspring? Or is the evidence presented so far, purportedly in support of such claims, at best irrelevant to them, and at worst a gross overstatement of what the data really mean?

One evening I returned home to find my wife correcting papers. When I asked her what we were doing for dinner, she said, “I want to go out.” Her words left no doubt that she wanted us to go to a restaurant, where we would have dinner.

When I came home the following night, I found my cat Pooh in the kitchen. She looked at me, walked over to an oriental rug in the next room, and began to sharpen her claws on it. Pooh knows I hate that, and as I went to stop her, she ran to the sliding glass door that leads outside. I yelled at her, but my wife said, “Don’t get mad; she’s just saying, ‘I want to go out.’”

Voilà! Both my wife and my cat can say, “I want to go out.” But do they both have language? Surely that is at best an oversimplification. Each can behave in such a way as to convey information to me. But the means by which they do this are radically different.

One way of approaching the distinction between communication and language is to note that communication is something we—and lots of other animals—do, whereas language is a tool that people can use to do that. People can, of course, communicate without language, though the range of information we can transmit by such means is limited. The same is true of the communication by animals and other organisms: it can transmit some fairly complex information or requests, but it still falls far short of something that is uniquely human: language.

Psychologists and others seeking to establish that such and such an animal either has language or at least has the cognitive ability to acquire language need to be able to say what language is. Their approach is commonly to make a list of characteristics and show that their animal does indeed exhibit all of them, or at least that they can teach it enough to pass a battery of tests.

That strategy poses a number of problems. Any specific set of characteristics is liable to need constant revision, because as linguists learn more about language, its characteristics change. Nevertheless, at least two of them—the use of arbitrary symbols for nouns and verbs, and the use of syntax—are critical to assessing language ability.

Investigators exploring the cognitive capacities of other species, particularly the people who study the putative language abilities of apes, have often complained about what seems to them a double
Animals communicate—without language—for a variety of purposes. The vocal sac of a male frog, ready to mate, expands; a randy male sage grouse’s feathers ruffle. Threats provoke communication: a cobra hisses; a porcupine bristles its quills, and a dog responds by barking and baring its teeth. Some animal communication is inadvertent, such as the scents exuded by and covering scavenging ants.
standard. E. Sue Savage-Rumbaugh, a biologist at Georgia State University in Atlanta, objects that linguists “keep raising the bar.”

First the linguists said we had to get our animals to use signs in a symbolic way if we wanted to say they learned language. OK, we did that, and then they said “No, that’s not language, because you don’t have syntax.” So we proved our apes could produce some combinations of signs, but the linguists said that wasn’t enough syntax, or the right syntax. They’ll never agree that we’ve done enough.

But linguists are not being capricious. What gives human language its power and its centrality in our lives is its capacity to articulate a range of novel expressions, thoughts, and ideas, bounded only by imagination. In our native language, you and I can produce and understand sentences we have never encountered before. Human languages have the property of including such a potentially infinite number of distinct sentences with discrete meanings because they are organized in a hierarchical and recursive fashion. Words are not just strung out one after another. Rather, they are organized into phrases, which themselves can be constituents of larger phrases, and so on—in principle, without any limit.

To see why that property is so important, suppose language did not have any syntax. Suppose that knowing how to speak a language were really just knowing a collection of words—lots of words, perhaps, but still a finite collection. In that case, speakers could talk only about a fixed range of things—namely, what they happen to have words for. Imagine you and I were at a baseball game, and our communication were restricted, somehow, to just such a finite collection of words. If the language did not have a specific word for “the third person in from the aisle in the front row of the upper deck,” without syntax I could not refer to that specific individual. I might be able to say something like “catchperson!” and point to the spectator I meant. But with the resources of English, even without special words, I can tell you that “the third person in from the aisle in the front row of the upper deck caught Bonds’s home run, but the guy behind him grabbed it away from him.” You can understand all that instantly and unambiguously, even if neither one of us, or the individuals referred to, are present. And the reason I can put this expression together, and that you can understand it, is that we share the syntax of English.

What gives us the power to talk about an unlimited range of things, even though we only know a fixed set of words at any one time, is our capacity for putting those words together into larger structures, the meanings of which are a function of both the meaning of the individual words and the way the words are put together. Thus we can make up new expressions of arbitrary complexity (such as the preceding sentence!) by putting together known pieces in regular ways.

Furthermore, the system of combination is recursive. What that means is that language users only need to know how to construct a limited number of different kinds of structures, because those structures can be used repeatedly as building blocks. Recursion enables speakers to build linguistic entities of unlimited complexity from a few basic patterns.

Among animals in the wild, there is simply no evidence that their communication incorporates any of these structures. Instead, communication is limited to a rather small, fixed set of “words.” Vervet monkeys, for instance, distinguish among a small number of different predators (eagle, leopard, and snake) and warn their fellow monkeys with a few distinct calls of alarm. Some groups have even adapted certain calls to announce something like “unfamiliar human coming”; others have developed a call for warning of dogs accompanying human hunters. Impressive as those behaviors may be, such an augmentation of the call system happened slowly, and the system itself remains limited. What’s more, vervets have no way of saying anything about “the leopard that almost sneaked up on us yesterday.”

The most persuasive claims about animal language come not from observing animals in the wild, but from attempting to teach various species of great apes to communicate via sign language or electronic consoles of symbols. Perhaps the best-known such project is Francine (Penny) Patterson’s effort to teach American Sign Language (ASL) to a gorilla named Koko. Koko is, by Patterson’s account, the ape that “really” learned sign language, using it the
way humans do—swearing, using metaphors, telling jokes, making puns. Unfortunately, we have nothing but Patterson's word for any of that. She says she has kept systematic records, but no one else has been able to study them. And without a way to assess Koko's behavior independently, the project is the best illustration imaginable of the adage that "the plural of 'anecdote' is not 'data.'"

Koko was a year old when Patterson began working with her in 1972. Patterson initially trained Koko by molding the gorilla's hands into the desired form, as she exposed the animal to whatever the sign symbolized. Koko caught on after a while and began to imitate. By the age of three and a half, Koko reportedly had acquired about a hundred signs, and by age five, almost 250.

Patterson also spoke aloud while signing, and it is reasonably clear that Koko's input was a kind of pidgin signed English rather than genuine ASL. That circumstance turns out to be a problem affecting several of the ape-language projects. Real ASL is a fully structured natural language, as expressively rich as English is. Hardly any of the investigators pursuing this research, however, have been fluent in ASL. As a result, the apes have not really been exposed to ASL, and so it is not surprising that they have come far short of learning it.

Since 1981, information about Koko has come only in forms such as NOFA or National Geographic television features, stories in the popular press, children's books, Internet chat sessions with Koko (mediated by Patterson, who acts as both interpreter and translator for the gorilla), and the ongoing public relations activities of Patterson's Gorilla Foundation. Such accounts make bold claims about how clever and articulate Koko is, but in the absence of evidence it is impossible to evaluate those claims.

And the information in the popular accounts does not inspire great confidence. Here is dialogue from a NOFA program filmed ten years after the start of the project (with translations for Koko's and Patterson's signing in capital letters):

**KOKO:** YOU KOKO LOVE DO KNEE YOU
**PATTERSON:** KOKO LOVE WHAT?
**KOKO:** LOVE THERE CHASE KNEE DO
**OBSERVER:** The tree, she wants to play in it!
**PATTERSON:** No, the girl behind the tree!

Patterson's interpretation, that Koko wanted to chase the girl behind the tree, is not self-evident, to say the least.

Sue Savage-Rumbaugh, whom I quoted above, has undertaken—along with her husband Duane Rumbaugh and others—what has proved to be the most substantial attempt so far to teach language to apes. Their subject, a bonobo named Kanzi, presents the most serious and genuine challenge to those who doubt the linguistic capacities of any nonhuman animal. Kanzi displays fascinating cognitive abilities that have not been documented before in any nonhuman primate. Yet he still falls well short of what an animal would have to do to truly acquire the structural essence of a human language.

What sets Kanzi's experience apart is that no one tried to teach him ASL or any other naturally occurring language. Instead, Savage-Rumbaugh and her team taught him a completely artificial symbol system, based on associations between meanings and arbitrary graphic designs called lexigrams. The lexigrams were available to the animal on a computer keyboard. Thus instead of issuing a series of signing gestures with his hands, Kanzi was expected to press the keys corresponding to what he (presumably) meant to say.

Actually, the research did not begin with Kanzi, but with his mother, Mata. At first, Mata was to have been trained to use the lexigram keyboard, but she turned out to be a rather poor student. The experimenters spent many long training sessions pressing lexigram keys on a keyboard connected to a computer, and indicating the intended referent. The computer responded by lighting up the key and uttering the spoken English word, but the training seemed to get nowhere.

Then something remarkable happened. Mata's infant son, Kanzi, was too young to be separated from her during the training sessions. When he was about two-and-a-half years old, however, Mata was removed to another facility for breeding. Suddenly Kanzi emerged from her shadow. Even though he had had no explicit training at all, he had learned to use the lexigram keyboard in a systematic way. He would make the natural bonobo handclapping gesture to provoke chancing, for instance, and then immediately hit the CHASE lexigram on the keyboard.

From then on, the focus of study became the abilities Kanzi had developed without direct instruction. In his subsequent training, the keyboard was carried around, and the trainers would press lexigrams as they spoke in English about what they and the animals were doing. While tickling Kanzi,
the teacher said, "Liz is tickling Kanzi," and pressed the three keyboard keys LIZ TICKLE KANZI. Kanzi himself used the keyboard freely to express objects he wanted, places he wanted to go, and things he wanted to do. The experimenters also tested Kanzi in more structured interactions, and Kanzi could still identify objects with lexi- grams and vice versa.

By the time he was about four years old, Kanzi had roughly forty-four lexi- grams in his productive vocabulary, and he could recognize the correspond- ing spoken English words. He performed almost flawlessly on double-blind tests that required him to match pictures, lexi- grams, and spoken words. He also used his lexi- grams in ways that clearly showed an extension from an initial, highly specific reference to a more generalized one. COKE, for instance, came to be used for all dark liquids, and BREAD for all kinds of bread—including taco shells.

Certainly further questions can be (and have been) raised about just what the lexi- grams represent for Kanzi. Nearly all the lexi- grams for which his comprehension can be tested are associated with objects, not actions, and so it is hard to assess the richness of his internal representations of meaning. Nevertheless, the lexi- grams do appear to function as symbols, independent of specific exemplars or other contextual conditions. And there is no ques- tion that he has learned a collection of "words," in the sense that he has associated arbitrary shapes (the abstract lexi- gram patterns) with an arbitrary sound (the spoken English equivalent), and he has associ- ated each of those with a meaning of some sort.

Assessing Kanzi's use of syntax is another mat- ter. A major difficulty is that one must evaluate two different systems, those of language pro- duction and of language recognition. Kanzi's production centers on the keyboard; his recogni- tion, on spoken English. To be sure not to under- estimate Kanzi's abilities, one must examine both systems for evidence of syntactic understanding.

Kanzi uses his keyboard, but he does not pro- duce enough multi-lexigram sequences to permit a detailed analysis of their structure. That is not to say he does not produce complex utterances. In addition to his keyed-in lexi- grams, he expresses himself with a number of natural, highly iconic gestures, with meanings such as "come," "go," and "chase." He also employs pointing gestures to designate people, and he frequently combines a lexi- gram with a gesture to make a complex utterance.

Such combinations, taken out of context, might look like evidence for internalized rules of syntax. Kanzi does exhibit some reliable tendencies, such as combining words in certain orders: an action word precedes an agent word, a goal precedes an action, an object precedes an agent. But the full data make a semantic analysis of those orderings beside the point, because virtually all Kanzi's complex utter- ances follow a single rule: lexi- gram first, then ges- ture. The combining principle is intriguing, but it is not evidence of syntax, because it has nothing to do with the role that the "words" involved play in the meaning of a communication. It is as if, in En- glish, we wrote the first word of the sentence, spoke the second, and emailed the third. Comparing the way the words were expressed, however, would tell us nothing about their meaning.

Because of such problems in interpreting his pro- ductions, arguments for Kanzi's command of syntax rely instead on his comprehension of spoken En- glish. Investigators compared Kanzi's understanding with that of a child named Alia, the daughter of one of Kanzi's trainers. The two were studied at a similar stage of language development, at least in terms of
the size of their vocabularies and the average length of their utterances.

Both Kanzi and Alia were quite skilled at responding appropriately to requests such as “put the ball on the pine needles,” “put the ice water in the pot,” “give the lighter to Rose,” and “take the snake outdoors.” Many of the actions requested (squeezing hot dogs, washing the TV, and the like) were entirely novel, so the subjects could not succeed simply by doing what one normally does with the object named.

The range of possibilities to which both Kanzi and Alia correctly responded was broad enough to show that each of them could form a conceptual representation of an action involving one, two, or more roles—that is, words could correspond to participants in action or locations of participants or actions. Both were then able to connect information in the utterance with those roles. Kanzi is the first nonhuman to show evidence for such an ability.

Kanzi can also make connections between word order and what the words express about the world. For example, he can distinguish between the sentences “make the doggie bite the snake” and “make the snake bite the doggie.” His success, at a minimum, implies he must be sensitive to regularities in word order. Such an ability is unprecedented in studies of animal cognition. Still, it does not in itself prove that Kanzi represents sentences in terms of the kind of structure that characterize human understanding of language.

In contrast, when the understanding of a sentence depends on “grammatical” words, such as prepositions or conjunctions, Kanzi’s performance is quite poor. He does not seem to distinguish between putting something in, on, or next to something else. Sentences in which the word and links two nouns (as in “give the peas and the sweet potatoes to Kelly”) or two sentences (as in “go to the refrigerator and get the banana”) frequently lead to mistakes that suggest Kanzi cannot interpret such words.

It is also not clear that Kanzi can understand subordinating conjunctions, such as that or which. It is true that he can correctly respond to sentences such as: “Go get the carrot that’s in the microwave.” But appropriate behavior alone does not imply that he has understood the sentence as having a hierarchical structure with an embedded clause, specifying a particular carrot (the one in the microwave) rather than any other (such as one on the counter or on the floor). The content words alone (“go,” “get,” “carrot,” “microwave”) are enough to convey the command: “carrot” has to be the object of “go get,” but “microwave” has no role to play in that action and can only be interpreted as a property of the carrot (its location). Kanzi needn’t understand the grammar to get the right carrot.

Concrete verbs and nouns correspond to observable actions and things in the world, and they can constitute the meanings of symbols for Kanzi. Prepositions and conjunctions, however, are important because they govern how words and phrases relate to one another. Kanzi can associate lexigrams and some spoken words with parts of complex concepts in his mind, but words that are solely grammatical in content can only be ignored, because he has no grammar in which they might play a role.

What then does it mean to use a natural language? Here is a classic example: “The chickens are ready to eat.” The sentence has two strikingly different interpretations, but the ambiguity has nothing to do with grammatical words, ambiguous words, or the multiple ways of organizing words into phrases. One interpretation is that someone has chickens that are ready for people to eat. The other interpretation is that some chickens are hungry.

The point is that the syntax of a language involves more than merely combining elements into sequences of words. Sentences incorporate that kind of structure, to be sure, but they also have much more structure, involving abstractions that are not readily apparent in the superficial form of the sentence—abstractions that allow the same group of words to communicate very different pieces of information in systematic ways.

As speakers of a natural language, we manage such abstractions without noticing them. But without them, language would not be the flexible instrument of expression and communication that it is. Perhaps that is the most important “take-home lesson” from the studies of animal communication. Nonhuman animals lack the kind of system that linguists are still hard at work trying to understand, and without such a capacity, animals can communicate only in much more restricted ways. The ability to use language is probably grounded in the biological nature that makes us the particular animal we are.

Adapted from Stephen R. Anderson’s forthcoming book, Doctor Doolittle’s Delusion: Animals and the Uniqueness of Human Language, which is being published this month by Yale University Press.