4 Animals and human language

> My principal Endeavour was to learn the Language, which my Master and his Children, and every Servant of his House were desirous to teach me. For they looked upon it as a Prodigy, that a brutal Animal should discover such Marks of a rational Creature. I pointed to everything, and enquired the Name of it, which I wrote down in my Journal Book when I was alone, and corrected my bad Accent, by desiring those of the Family to pronounce it often. In this Employment, a Sorrel Nag, one of the under Servants, was ready to assist me.
>
> **Jonathan Swift (1726)**

In the preceding chapter, we concentrated on the ways in which human language is distinct from the 'languages' of other creatures. If human language is indeed such a unique form of communication, then it would seem inconceivable that other creatures would be able to develop an understanding of this specialized human mode of expression. Some humans, however, do not behave as if this is the case. There is, after all, a lot of spoken language directed by humans to animals, apparently under the impression that the animal follows what is being said. Riders can say *Whoa* to horses and they stop (or so it seems), we can say *Heel* to dogs and they will follow at heel (well, sometimes), and, in circus rings, a variety of animals go *Up*, *Down* and *Roll over* in accordance with spoken commands. Should we use these examples as evidence that non-humans can understand human language? Surely not. As far as animal behavior is concerned, the standard explanation is that the animal produces a particular behavior in response to a particular sound-stimulus, but does not actually 'understand' the meaning of the words uttered.

If it seems difficult to conceive of animals 'understanding' human language, then it appears to be even less likely that an animal would be

capable of 'producing' human language. After all, we do not generally observe animals of one species learning to produce the signals of another species. You could keep your horse in a field of cows for years, but it still won't say *Moo*. And, in many households, a new baby and a puppy may arrive at the same time. Baby and puppy grow up in the same environment, hearing mostly the same things, but about two years later, the baby is making human noises and the puppy is not.

But perhaps a puppy is a poor example. Wouldn't it be better to work with a closer relative, such as a chimpanzee? After all, the chimpanzee does have 99% of its basic genetics in common with the human.

Chimpanzees and language

The idea of raising a chimp and a child together may seem like a nightmare, but this is basically what was done in an early attempt to teach a chimpanzee to use human language. In the 1930s, two scientists (Luella and Winthrop Kellogg) reported on their experiences of raising an infant chimpanzee together with their infant son. The chimpanzee, called Gua, was reported to be able to understand about a hundred words, but did not 'say' any of them. In the 1940s, a chimpanzee named Viki was reared by another scientist couple (Catherine and Keith Hayes) in their own home, exactly as if she were a human child. These foster parents spent five years attempting to get Viki to 'say' English words by trying to shape her mouth as she produced sounds. Viki eventually managed to produce some 'words', rather poorly articulated versions of *mama*, *papa* and *cup*. In retrospect, this was a remarkable achievement since it has become clear that non-human primates do not have a physically structured vocal tract which is suitable for producing human speech sounds. Apes and gorillas can, like chimpanzees, communicate with a wide range of vocal calls, but they just cannot speak.

Washoe

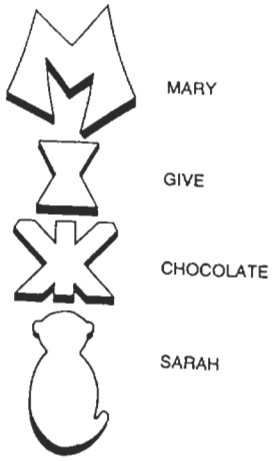
Recognizing that a chimpanzee was a poor candidate for spoken-language learning, Beatrix and Allen Gardner set out to teach a female chimpanzee called Washoe to use a version of American Sign Language. This sign language, used by the deaf, has all the properties described earlier as basic features of human language and is learned by many congenitally deaf children as their natural first language. (It is discussed in greater detail in Chapter 18.)

Beginning in June 1966, the Gardners and their research assistants raised Washoe like a human child in a comfortable domestic environment. Sign

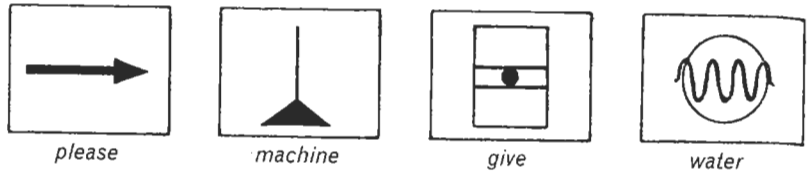
language was always used when Washoe was around and she was encouraged to use signs, even her own incomplete 'baby-versions' of the signs used by adults. In a period of three and a half years, Washoe came to use signs for more than a hundred words, ranging from *airplane*, *baby* and *banana* through to *window*, *woman* and *you*. Even more impressive was Washoe's ability to take these forms and combine them to produce 'sentences' of the type *gimme tickle*, *more fruit* and *open food drink* (to get the refrigerator opened). Some of the forms used appear to have been inventions by Washoe, as in her novel sign for *bib* and in the combination *water bird* (referring to a swan), which would seem to indicate that her linguistic system had the potential for productivity. Moreover, Washoe demonstrated understanding of a much larger number of signs than she actually produced. She also seemed capable of holding rudimentary conversations, mainly in the form of question–answer sequences. A similar conversational ability with sign language was reported for a gorilla named Koko not long after.

Sarah and Lana

At the same time as Washoe was learning sign language, another chimpanzee named Sarah was being taught (by Ann and David Premack) to use a set of plastic shapes for the purposes of communicating with humans. These plastic shapes represented 'words' which could be arranged (Sarah preferred a vertical order) in sequence to build 'sentences'. The basic approach was quite different from that of the Gardners. Sarah was systematically trained to associate these shapes with objects or actions. She remained an animal in a cage, being trained with food rewards to manipulate a set of symbols. Once she had learned to use a large number of these plastic shapes, Sarah was capable of getting an apple by selecting the correct plastic shape (a blue triangle) from a large array. Notice that this symbol is arbitrary, since it would be hard to argue for any natural connection between an apple and a blue plastic triangle. Sarah was also capable of producing 'sentences' such as *Mary give chocolate Sarah*, and had the impressive capacity to understand complex structures such as *If Sarah put red on green, Mary give Sarah chocolate*. Sarah got the chocolate.



A similar training technique with a similar artificial language was used (by Duane Rumbaugh) to train a chimpanzee called Lana. The language she learned was called Yerkish and consisted of a set of symbols on a large keyboard linked to a computer. When Lana wanted some water, she had to press four symbols, in the correct sequence, to produce the message *please machine give water*.



Both Sarah and Lana demonstrated an ability to use what look like logographic codes and basic structures in ways which superficially resemble the use of language. There was, however, a lot of skepticism regarding these apparent linguistic skills. It was pointed out that when Lana used the symbol for 'please', she did not have to understand the meaning of the English word *please*. There was no choice involved, as, for example, in omitting *please*, as we often do, in order to produce a different, but nevertheless meaningful, 'utterance'. The symbol for 'please' on the computer keyboard was the equivalent of a button on a vending machine and, so the argument goes, we can learn to operate vending machines without necessarily knowing language. The strongest arguments against accepting the achievements of Washoe, Sarah and Lana as evidence of linguistic abilities have been put forward by the psychologist Herbert Terrace, who worked with a chimpanzee called Nim.

Nim Chimpsky

The name given to this chimpanzee, Nim Chimpsky, was a deliberate play on the name of the linguist Noam Chomsky, who had claimed that language is an innate ability and unique to the human species. Perhaps Nim would show that Noam was mistaken.

Beginning in 1973, a concentrated effort was made to teach Nim American Sign Language under controlled conditions, with careful records and videotaping of Nim's classroom activities. Over a two-year period, Nim produced a large number of single-word signs, developed two-word combinations such as *more drink* and *give banana*, and used them in appropriate circumstances. The initial impression was that Nim, like Washoe, was developing an ability to use language in much the same way as human children. However, this impression did not survive some close inspection of the videotaped record. The structure of Nim's longer 'utterances' was simply a repetition of simpler structures, not an expansion into more complex structures, as produced by human children. Moreover, in contrast to the human child, Nim only rarely used sign language to initiate interaction with his teachers. In general, he produced signs in response to their signing and tended to repeat signs they used.

This type of finding prompted Terrace to reinvestigate the filmed record of Washoe's use of sign language and led him to argue that both Nim and Washoe only appeared to use signs as language. In fact, he argued, they were simply producing prompted repetitions of their teachers' signs, yet being interpreted as if they were taking part in 'conversations'. His conclusion was that chimpanzees are clever creatures who learn to produce a certain type of behavior (signing) in order to get rewards, and who are essentially performing sophisticated 'tricks'. Consequently, their signing is not linguistic behavior at all.

Hans, Buzz and Doris

The arguments presented by Terrace are very similar to those which have been used in the past to discredit claims that any animal was capable of understanding and using any form of linguistic communication. At the turn of the century, a German horse called Clever Hans astounded many by using hoofbeats to answer arithmetical questions and to tap out the letters of the alphabet. However, it was demonstrated that Hans was actually responding to subtle visual cues provided by those asking him questions. If the questioner didn't know the answer to the question, he couldn't unconsciously indicate that Hans had tapped the correct number of hoofbeats and consequently Hans got the answers wrong.

In the 1960s, two dolphins called Buzz and Doris were reported to have developed a means of signaling, across an opaque barrier, which enabled one of them to 'tell' the other how they could both get a fish snack. When Doris saw a flashing light, she had to press a paddle on the left-hand side and 'tell' Buzz (who couldn't see the light or Doris) to press his left-hand paddle. When the light was kept steady, Doris had to press the right-hand paddle and 'tell' Buzz to press his right-hand paddle. Over thousands of trials, these dolphins inevitably got the fish. However, it turned out that Doris would continue to 'tell' Buzz when Buzz could see the light himself and even when Buzz was taken out of the tank. The conclusion was that Doris's behavior consisted of conditioned responses to the different light signals and Buzz's behavior was conditioned to responding to Doris's calls.

The controversy

These two phenomena, the unwitting cues provided by human trainers and the conditioned response behavior of animals, are usually cited as the explanation of language-like behavior in animals generally, and of chimpanzees in particular. However, those foster parents of Washoe, the Gardners, have argued that they were not 'animal trainers', nor were they inculcating and then eliciting conditioned responses from Washoe. In a complex experiment, designed to eliminate any possible provision of cues, they showed that, in the absence of any human, Washoe could produce correct signs to identify objects in pictures. They also emphasize what they consider to be a major advantage of their approach over most other work with chimpanzees. They note that Terrace carefully instructed his research assistants to remember that Nim was a research animal and not a child. Most of Nim's training took place in a bare windowless cell and the majority of research assistants involved were not fluent in American Sign Language. The Gardners point out that a deaf human child might not develop into a fully interactive and sociable user of sign language under comparable circumstances.

In sharp contrast, the Gardners have stressed the need for a domestic environment, without cages, in which the chimpanzee has a lot of opportunity for imaginative play and interaction with fluent sign language users who use the language normally with each other. They report that a group of younger chimpanzees (Moja, Pili, Tatu and Dar) not only learned sign language, but used it with each other and with Washoe, even when there were no humans present. In a later development, an infant chimpanzee

named Loulis was adopted by Washoe and, without any human training at all, developed a signing vocabulary of more than fifty signs.

Sherman, Austin and Kanzi

The idea of chimpanzees developing language-like skills with other chimpanzees was also crucial in the case of Sherman and Austin. As reported by Sue Savage-Rumbaugh, these two chimpanzees became the first to communicate with each other using a version of the printed symbols of Yerkish (developed initially for Lana). But the most exciting development in this area came about almost by accident.

While Savage-Rumbaugh was attempting to train a bonobo (a kind of chimpanzee) called Matata how to use the symbols of Yerkish, Matata's nursing baby, Kanzi, was always with her. Although Matata did not do very well, her son Kanzi spontaneously started using the symbol system with great ease. He had learned not by being taught, but by being exposed to, and observing, language in use. Kanzi eventually developed a large symbol vocabulary (over 250 forms). By the age of eight, he had become capable, via associations of symbols with spoken words, of understanding spoken English at a level comparable to a two-and-half-year-old human child. He had also become capable of asking to watch his favorite movies, *Quest for Fire* (about primitive humans) and *Greystoke* (about the Tarzan legend).

The barest rudiments

There are important lessons which have been learned from attempts to teach chimpanzees to use some forms of language. We have answered some questions. Were Washoe and Kanzi capable of taking part in interaction by using a symbol system which was chosen by humans and not chimpanzees? The answer is clearly "Yes". Did Washoe and Kanzi perform linguistically on a level comparable to a human child of the same age? The answer is just as clearly "No". In addition, one of the most important lessons for those who study the nature of language is the realization that we clearly do not have a totally objective and non-controversial definition of what counts as 'using language'. We assume that when young human children make 'language-like' noises we are witnessing language development, but when young chimpanzees produce 'language-like' signs in interaction with humans, many scientists are very unwilling to classify this as language use. Yet, the criteria we use in each case do not seem to be the same.

This problem remains, as does the controversy among different psychologists over the reported abilities of chimpanzees to use language. However,

given the mass of evidence from the studies described here, we might suggest that the linguist Noam Chomsky should revise his claim that "acquisition of even the barest rudiments of language is quite beyond the capacities of an otherwise intelligent ape". We may not have had reports on the chimpanzee view of linguistic theory, but on their obvious capacity to cope with "the barest rudiments of language" we certainly have.

Study questions

1 Have any chimpanzees ever been taught to produce human speech sounds? What's been the problem?
2 In Sarah's vocabulary, the color 'red' was represented by a grey plastic shape. If Sarah could use this plastic shape to convey the meaning 'red', which property does her language have?
3 What was the basis of Terrace's conclusion that the chimpanzee's use of sign language is not true language?
4 How did the Gardners try to show that Washoe was not necessarily repeating signs made by interacting humans?
5 What was the key element in Kanzi's language learning?

Discussion topics/projects

A The most persistent criticism of the chimpanzee language-learning projects is that the chimpanzees simply make responses like trained animals for rewards and are consequently not using language to express anything. Read over the following reports (from Rimpau *et al.*, 1989) and try to decide how the different chimpanzees' behaviors should be characterized. (Signs are represented by capital letters.)

Greg was hooting and making other sounds, to prevent Dar from falling asleep. Dar put his fist to Greg's lips and made kissing sounds. Greg asked, WHAT WANT? and Dar replied, QUIET, placing the sign on Greg's lips.

After her nap, Washoe signed OUT. I was hoping for Washoe to potty herself and did not comply. Then Washoe took my hands and put them together to make OUT, and then signed OUT with her own hands, to show me how.

Moja signed DOG on Ron and me, and looked at our faces, waiting for us to "woof". After several rounds, I made a "meeow" instead. Moja signed DOG again, I repeated "meeow" again, and Moja slapped my leg harder. This went on. Finally, I woofed and Moja leapt on me and hugged me.

Moja stares longingly at Dairy Queen as we drive by. Then for a minute or more signs NO ICE CREAM many times, by shaking her head while holding fist to mouth, index edge up.

B What do you think is meant by "the Clever Hans phenomenon" and how could it be avoided in studies of linguistic behavior in animals? (A good resource is the collection of papers in Sebeok & Rosenthal, 1981.) When people tell stories of how intelligent their pets are, does it typically sound like yet another version of Clever Hans, or are other explanations possible?

C What are the advantages and disadvantages of the different symbol systems (plastic shapes, keys on a computer console, sign language) which have been used with chimpanzees? Which system (one of these or one of your own invention) would you use if you were given the opportunity to try to teach language to a chimpanzee?

D Here are some examples of (i) the earliest two-word combinations of a typical child and some examples of (ii) the two-sign combinations from Washoe. On the basis of this evidence, do you think that the child and Washoe are doing essentially the same linguistic thing?

(i)	(ii)
red book	baby mine
mommy lunch	go flower
go store	drink red
hit ball	tickle Washoe
book table	more fruit

E Among those who are critical of even the idea of chimpanzees having the capacity for language, a common argument is based on differences in evolutionary biology, as exemplified in the following paragraph from Wallman (1992: 109). What additional arguments can you provide for or against this point of view?

> Is it absurd to consider the linguistic incompetence of apes as something requiring explanation? After all, no one would think to pose the question of, say, why *Homo sapiens* cannot fly, or why birds cannot swim. These questions are not asked because it is assumed that taxa separated by millions of years of evolution will differ in their adaptations, the extent of the divergence corresponding roughly to the length of that separation, barring parallel or convergent evolution. Given that our lineage diverged from the most closely related hominoid at the very least four million years ago, which separates us by eight million years of independent evolution, why is it thought likely by some that an ape species would possess a human faculty, especially an unused form of it?

Further reading

Some basic background on the topic can be found in Linden (1976) and Sebeok & Sebeok (1980). More recent overviews are presented in Linden (1987), Premack (1986) – which are favorable, and Wallman (1992) – which is highly critical. For more general background, such as the extent to which humans and chimpanzees have nearly identical genetic make-up, see Deninger & Schmid (1976) or King & Wilson (1975); on the features of natural primate communication, see Snowdon *et al.* (1982); and on the vocalizations of apes, see Goodall (1986). More specifically, life with Gua is described in Kellogg & Kellogg (1933), life with Viki in Hayes (1951). On the original Washoe project, see Gardner & Gardner (1969); on later developments, see Gardner & Gardner (1978) and, more recently, see Gardner *et al.* (1989). On Washoe and Loulis, see Fouts *et al.* (1989). On Koko, see Patterson & Linden (1981). On Sarah, see Premack & Premack (1983; 1991), and on Lana, see Rumbaugh (1977). For Nim's experiences, see Terrace (1979) which is reviewed very critically by Gardner (1981). On Sherman and Austin, read Savage-Rumbaugh (1986) and on Kanzi, read Savage-Rumbaugh & Lewin (1994). On Clever Hans, see Pfungst (1911) and Sebeok & Rosenthal (1981), and on Buzz and Doris, check Evans & Bastain (1969). The quotation regarding 'the barest rudiments' is from Chomsky (1972).