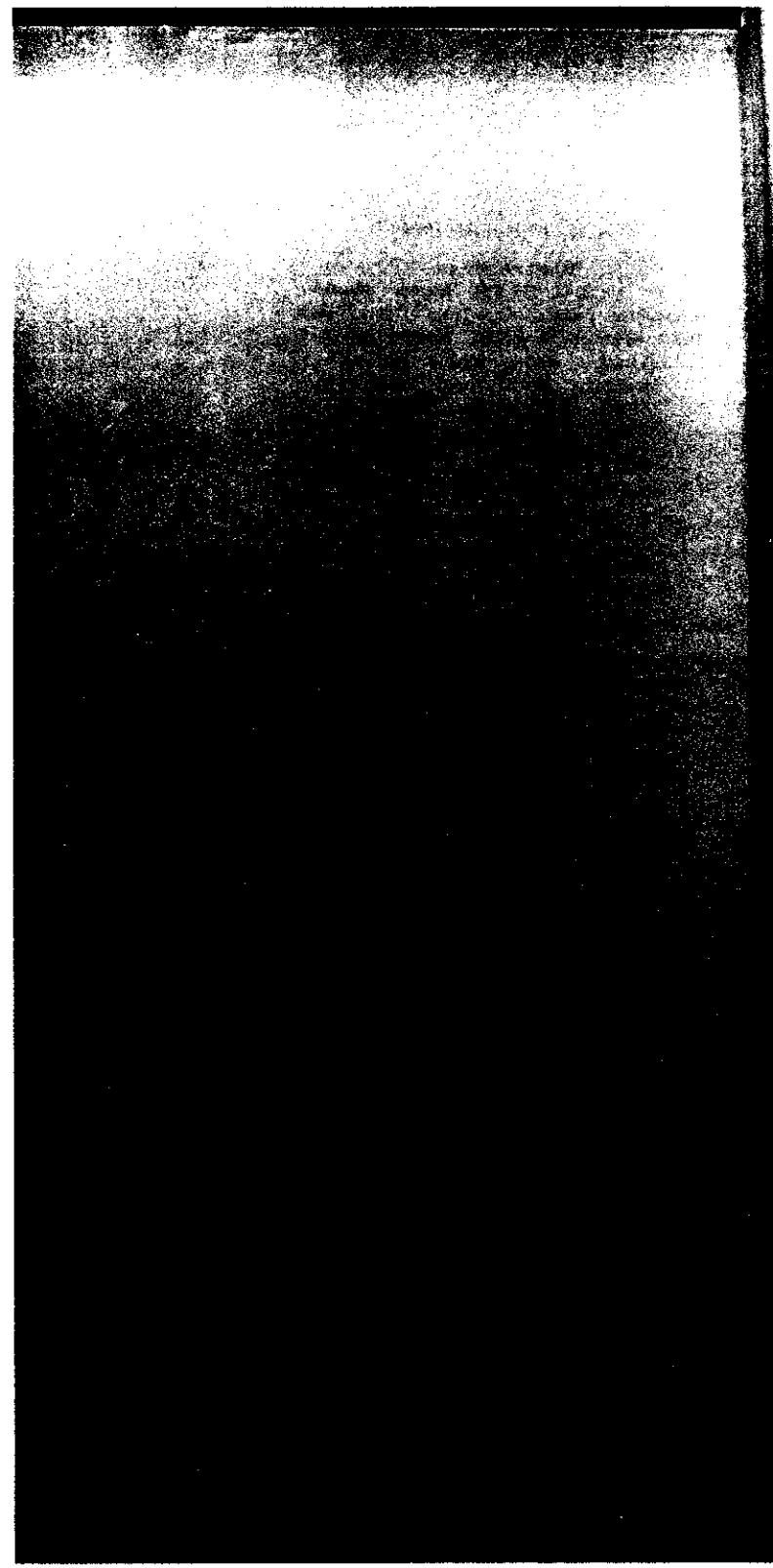

APES, LANGUAGE, *and the* HUMAN MIND

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CHAPTER 1

Bringing up Kanzi

Kanzi came to the Georgia State University Language Research Center in Atlanta, Georgia, in 1980 with his mother, Matata, when he was just six months old, but his story really starts even before he was born. Matata arrived in Atlanta in 1975, the same year I did. I had elected to come, because I knew bonobos were in Atlanta. Matata came because she was netted, placed in a helicopter, and flown here. I came from Norman, Oklahoma, where I had been studying Washoe, Lucy, Booee, and Bruno—apes who were being taught sign language. Matata came from Zaire (now known as the Congo), the only place in the world where bonobos occur in nature.

In 1975, hardly anyone knew what a bonobo was. Zoos still confused them with chimpanzees, housing both groups together as "racial variants" of the same species. Dr. Kano of Japan was just starting his studies of wild bonobos in Zaire, but he had begun to learn some intriguing things: Bonobo social groups are very stable compared to the fluid and dynamic gatherings of common chimpanzees. Moreover, they are often large and composed of nearly equal numbers of males and females. The males are unusually passive, and in all groups there are close bonds between the sexes.

In contrast, chimpanzee males are domineering and aggressive. Common chimpanzee traveling parties consisted of only a few individuals, and bonds between the sexes are close only for a few days each month when females are sexually receptive.

Bonobo females are nearly always sexually receptive, and they form close friendships with males and with other females. Most surprising is the low level of aggression among bonobos. They prefer making love to making war, and are, by human standards, quite adept and profligate in their sexual endeavors. The all-male war parties and the infanticide that occasionally characterize the social contract of common chimpanzees are absent in the bonobo.

Bonobos hold a special fascination for primatologists because of the way their entire social organization pivots around sexual behavior. If they were a primitive and only recently discovered human society, we would be compelled to say that their groups are held together by love, expressed in a most direct and physical manner, between all individuals, regardless of age or sex. Human sexual behavior, widely touted among the animal kingdom for its variety and its frequent nature, is overshadowed by the bonobo. Unlike ourselves, bonobos do not recog-

nize that sexual behavior is linked to the birth of offspring and all its consequent responsibilities. Therefore, they have no need to define kinship and its attendant duties and regulations. Sexual behavior is something that is freely enjoyed, without consequence, by all group members. Just as we hug each other in happiness and excitement, to make up after an argument, to seal an agreement, or to welcome someone back, so does the bonobo, except their hugs often include sexual contact, as they have no need for clothes and no need to regulate sexual exchanges.

Only in 1929 were bonobos recognized as a distinct species of ape, and even in the 1980s many people considered them to be merely diminutive chimpanzees. Consequently, when the National Academy of Science suggested that bonobos were an indigenous resource that should be protected and cultivated in Congo, some scientists maintained that bonobos were not sufficiently different from chimpanzees to warrant such special treatment. Thus, three animals were captured from the wild, with the permission of the Congolese government, and taken to the Yerkes Regional Primate Center in Atlanta, Georgia, where researchers were to determine whether they, in fact, differed sufficiently from chimpanzees to warrant separate treatment. If so, it was hoped that a special center for their study would be set up in Congo.

It is clear that with regard to their social behavior and group structure, bonobos resemble human beings more than other living apes do. Their mood, temperament, and hesitant but curious nature set them apart from other apes. At times, as I watch them, I seem to be staring into my own distant past and seeing in front of me "quasi persons"—not people, but "near people." The feeling is as though, in an eerie and inexplicable way, I am watching a species that is not the same as me yet is connected to me—is part of me. Even after many years of watching and studying bonobos, I still cannot help but sense that I am in the presence of the emergence of the human mind, the dawn of our peculiarly human perspective and feeling.

Certainly these creatures cannot plan ahead as we do, organize large societies, or produce complex tools, calendars, and religions. Yet for me, there is more to being human than such abstract intelligent actions. There is a kinship I recognize when I interact with young children that does not depend on these abstract skills. It is a kinship of awareness that others share some of my feelings and I theirs. I know, at least in part, how other people feel, and they know how I feel.

With bonobos, I experience a similar two-way understanding. I know how they feel, and they know how I feel. This is possible because of the expressions that emanate from their faces, the way they interpret the feelings of others, the depth of their commitment to one another, and the understanding of one another that they share. Their sharing of emotional perspective is of a peculiarly human sort, and I relate to it, and am bound into their feelings, in a natural human manner, without effort. A human does not need to read a catalogue of bonobo facial expressions or vocalizations to understand the bonobo. When I observe a bonobo, it is as though I am standing at the precipice of the human soul, peering deep into some distant part of myself. This is a perception I cannot shake off or dissuade myself from, no matter how often I try to tell myself that I have no definitive scientific basis for these impressions.

Kanzi's adopted mother, Matata (right), looking toward the older female, Lokelema, with a facial expression that is requesting comfort.

Kanzi's father, Bosondjo, expresses happy and alert interest in events in the adjacent cage, while being groomed by Lokelema.

Lokelema looking up with an expression of concern and hesitancy.

According to our current understanding, bonobos and common chimpanzees went their own evolutionary ways two to three million years ago, some time after our own ancestor split off from the common lineage. We are more distantly related to gorillas and orangutans, as they diverged from the line that led eventually to man some six to eight million years ago. There is no current evidence that suggests that we are more closely related to the bonobo than to the common chimpanzee; yet the bonobo shares with man an emotional capacity for understanding the feelings of others that can only be described as almost human.

The arrival of the three bonobos who had traveled from the depths of Congo to the small, cramped, and dim cage on the end of the Yerkes great ape wing never lead to the establishment of a center for bonobo husbandry and research in Congo as the National Academy of Science had hoped. Many primatologists protested the importation and potential use of a rare and endangered species in any sort of research. Their attention damped international interest in the project; as a result, the people of Congo still, even today, have no understanding of their significant and unique indigenous resource, the bonobos.

As Lokelema, Bosondjo, and Matata grew older, they were joined by several more bonobo females on loan from the Atlanta Zoo. Bonsondjo fathered a number of infants with these females, one of whom was to become the first animal ever to learn language without training, as a child does, and thus the first to truly understand a spoken human language.

Many animals have learned to do tricks in response to spoken commands, but this young bonobo was different. He did not just do what he was told; indeed, he often *refused* to do what he was told even though he understood. This bonobo

Talking with Kanzi about where we might travel in the forest.

came to understand language—how it works and how it may be used. He was able to interpret spoken sentences that he was hearing for the very first time. He also learned to read printed symbols and to use these symbols to talk to people.

His name is Kanzi. In Swahili, Kanzi means "bold and brave." Kanzi certainly is bold and brave as he dares to be the first nonhuman to cross what had been assumed to be an unbridgeable boundary between the world of animals and the world of humanity. Kanzi has shown us that we are not alone among God's creatures to have been blessed with the gift of mind.

Kanzi: The Ape Who Crossed the Line

What is Kanzi like? How humanlike is he? Once you know him well, it often seems as though he is a person who has been stuffed into a fur suit and endowed with superhuman strength, a rather short temper, intense emotions, a desire to dominate all he sees, an impulsive personality, and an extraordinary sensitivity.

I keep having to remind myself that Kanzi is not really a person; at least, he doesn't *look* like a person, and he doesn't sound like a person. But it's hard to think of him any other way when I am with him for long, because he acts so much like a person. He understands my moods, my thoughts, my feelings, and my emotions. Many people say that dogs and other animals have such a skill, but Kanzi is different. It's not an "animal intuition" that characterizes Kanzi; he does not "divine" my thoughts but rather listens with sensitivity and concern when I explain

them to him. There is an empathy that human beings share with others for whom they care. Kanzi shares this empathy, for he can read my facial expressions as well as, if not better than, any human being I have ever known.

Kanzi, as an adult, measures up to his name; he is bold and brave; he is also large (165 pounds) and very strong—five times stronger than a 165-pound human male in excellent physical shape. I cannot tell Kanzi what he must do or what he should not do. I can only advise him of the probable consequences of his actions and leave the decision up to him. He listens to me, but he does not always believe me when he cannot understand the reason for what I have said. Kanzi always wants to find out for himself whether I am right or not.

Take, for example, electrical outlets. How does one explain electricity to an ape? I have just tried to tell Kanzi that "shocks" come out of the wall—that the small hole in the wall is dangerous and can hurt him badly. It is clear that he understands something of what I have said to him, because he approaches the outlet with extreme caution, his hair on end. He smells it, he looks at it, he even throws something at it gingerly. The outlet just sits there. Kanzi stares at me with a rather incredulous look on his face—why, he wonders, do I think this thing is dangerous, and why did I lecture him so when he started to stick a screwdriver into it? It appears perfectly harmless to him. As I continue to maintain that this thing on the wall is dangerous, his curiosity becomes fully aroused.

Kanzi had never thought much about those things on the wall, but that day when he was playing with tools he noticed some screws on an outlet and tried to unscrew them. When that did not work, he decided to use the screwdriver to pry the thing off the wall and see what was under it. That was when I presented him with an impassioned explanation of "electricity" and its dangers. Kanzi did not understand the word "electricity," but he did know that I was saying the thing on the wall could hurt him and that I was seriously concerned about this possibility.

At a certain age, Kanzi began to wonder if everything I told him was really true. He had discovered that he could evaluate things for himself, and that many things that I could not do, he could. He could, for example, climb eighty-foot trees without falling or leap between them at heights that scared me just watching him. So naturally he wondered why he could not stick a screwdriver into the electrical outlet.

Waiting until I was not looking, he carefully hid the screwdriver under a blanket. Then, when I was thoroughly occupied with going through a stack of pictures to make a selection for a test of his comprehension, he removed the screwdriver from its hiding place and placed it directly in the outlet. Fortunately it had been insulated with a plastic handle, and Kanzi was not hurt. However, there was no doubt that he experienced a shock. He stood ramrod straight, and his hair rose two inches. He yanked the screwdriver out of the socket and immediately burst into a series of emphatic "Waa" sounds.

This time, Kanzi knew that this harmless-looking thing really was dangerous. He began throwing balls, bowls, blankets, toys, and anything else he could lay his hands on at the electrical outlet. He gestured for me to do the same thing—thinking, I presume, that we needed to attack the thing and get it out of there.

It certainly did not seem reasonable to Kanzi to have such a dangerous thing right there in the room with us. I could understand his point of view. Certainly,

when we encountered snakes outdoors, that was exactly my strategy—throw something at them and get them to go away. Quite obviously, however, this strategy would not work with electrical outlets. One simply has to let them, and all the dangers they entail, stay right in one's room.

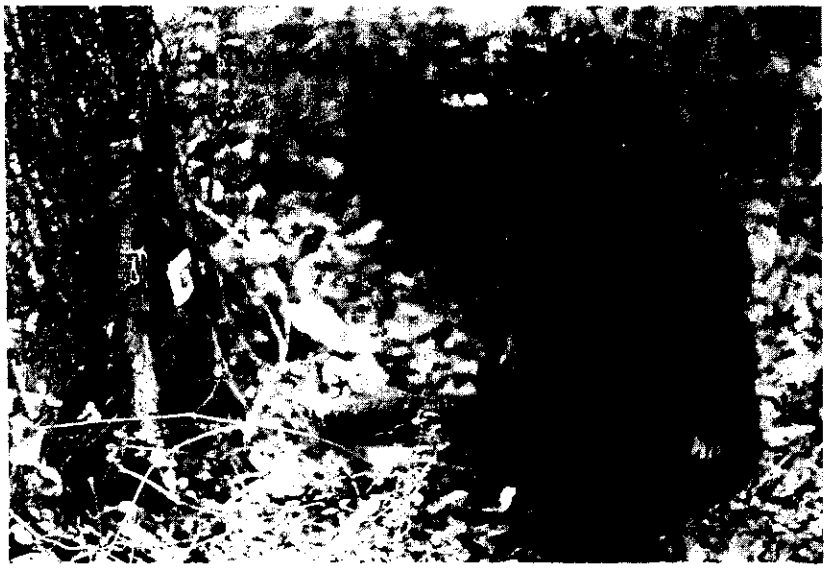
Kanzi never really doubted me when I explained that snakes were dangerous. Looking at them, he seemed to agree. However, it was not only electrical outlets that he wanted to test but many other things, such as every type of mushroom that grew in the forest, any dog that dared to bark at him, those large funnel-shaped nests that hornets fly in and out of, any tree or large tree branch that appeared a bit too rotten to support his weight, every rooftop that he encountered, the cans of insect repellent we felt compelled to take with us into the forest, and on and on. Like any normal four- or five-year-old boy, Kanzi viewed danger as a challenge to be overcome at the first opportunity. Only unlike a four- or five-year-old human boy, Kanzi had the strength, the agility, and the speed of a super athlete. Moreover, he could use these skills from any position on land or in the trees.

Kanzi was not so brave when, at six months of age, he arrived at the Language Research Center with his mother Matata. Like all ape infants, he stayed with his mother constantly and was carried by her wherever she went. Matata was not Kanzi's biological mother, though she had reared him from the time he was only thirty minutes old, after being permitted to hold him by his natural mother. Matata liked Kanzi so much, however, that she refused to give him back. Because she was nursing her own infant at the time, she was equipped to care for Kanzi. Not knowing any differently, Kanzi elected to stay with Matata.

Bonobo mothers, unlike gorilla, orangutan, or chimpanzee mothers, permit others to carry and fondle their offspring, though generally not until they are a few months old. By that age they are sufficiently bonded to the mother to insist upon returning to her after being held by another. Kanzi's real mother, Lorel, had been raised in a nursery, and Kanzi was her first infant. She apparently did not understand that she should wait awhile before permitting others to hold him. And Kanzi, not having learned who his mother was yet, settled happily into Matata's lap.

By the time Matata and Kanzi arrived at the Language Research Center, when Kanzi was six months old, Matata was willing to allow others to hold him. I had known Matata well for five years and had earned her trust before she had been transferred from the Language Research Center to the Yerkes Field Station where Kanzi was conceived and born. Matata had trusted me ever since I first befriended her, shortly after her unplanned arrival from Congo. I had done my best to ease the transition from the friendly world of free bonobos to that of cold cages and people who wore shiny boots, white coats, and sprayed lots of water. I had wanted Matata to learn not to be scared of all humans and that there were some who cared about how she felt. Matata had come to understand this, and was always gentle with me. Although Matata and I had not seen each other in more than a year, I was not surprised that she was willing to let me care for Kanzi for short periods of time.

What did surprise me was that Kanzi, who before this moment had never touched or smelled a person, was even more eager to meet me than I was to meet him. Without warning, he emitted an electrifying scream and propelled himself from Matata's arms to mine by literally turning in the air as he leapt through space.



Kanzi traveling with Matata in the forest. She has just found a bit of food at a tree marked with a lexigram. Kanzi is taking keen visual note.

He threw both arms and legs around my midsection and looked directly into my eyes with his lips pulled back in a grin that was pasted across his face like that of a clown, all the while screaming at the top of his lungs in the best bonobo fashion that a six-month-old could muster.

My legs and arms began to tremble, for although Matata and I had been friends in the past, we'd hardly had time to say "hello" before her son had jumped onto me. I was scared that somehow she might think I was hurting him because he screamed so loudly and held on so tightly. I feared that at any moment Matata was also going to leap upon me and grab Kanzi away, perhaps not before leaving me with numerous severe gashes from her razor-sharp canines. Female bonobos, although generally gentle, possess the equipment to do serious damage with their surgically sharp canines and lightning-fast reactions. Although Matata had been my friend, I knew that mothers are willing to inflict severe injury on any opponent if they conclude that their infants are in danger. Moreover, I posed no threat at all to Matata. Neither my strength nor my teeth began to match hers, and her infant was in my arms screaming at the top of his lungs. Not knowing what to do, I did nothing. Matata, knowing full well what to do, also did nothing.

As I was later to realize, this was just Kanzi's way of greeting me when he was aroused, and just then he was extremely excited, since I was the first human being to whom he had ever clung.

I later learned that the best way to calm Kanzi down when he was so aroused was to scream back just as loudly myself and pat him firmly on the back to show that I was happy to have him holding onto me. Though I did not realize it at the time, Kanzi was screaming only because he was somewhat frightened of me and fearful that I might not want him to cling to me, even though he had indicated, by his gestures and vocalizations, that he was nearly desperate to meet me. I was amazed and gratified that both Matata and Kanzi accepted me and that Kanzi wanted me to hold him. As soon as we got our messages of interest and acceptance across to each other, Kanzi calmed down and began to show a quiet fascination with my face, my hair, my shirt, my shoes, my pockets, my raised nose—as opposed to the flat bonobo nose—and all the other things that differentiated me from his mother. And so began an infatuation of two species, each for the other, that was to last for all three of our lifetimes and was to extend to Matata's future offspring as well.

Would a Bonobo Learn Language?

Although Kanzi was extremely cute, adorably playful, and as hilariously funny as any young bonobo infant could be, my immediate goal was to teach his mother Matata how to use symbols to communicate her desires and needs. Kanzi, I assumed, was far too young for such instruction. His turn would come much later, when he was two or three years old—old enough to pay attention during training sessions.

I knew all too well how easy it is for apes to become confused when presented with the complex geometric symbols that had been learned by the chimpanzees Lana, Sherman, and Austin, as well as by Tetsuro Matsuzowa's chimpanzee Ai in Japan. Before Kanzi was born, I had been teaching language to common chimpanzees for eight years. I knew that with patient and systematic training it was possible for such apes to learn to read printed symbols. They could also use these symbols to communicate simple things such as the kind of foods and drinks they desired; whether they wanted to go outdoors, be groomed, or play tickle or chase; and if they were frightened. Yet they were also likely to confuse symbols if new ones were introduced too rapidly or if they did not really understand what the symbol represented. Sometimes they would also use any symbol, whether they understood it or not. This meant that one had to be certain that they really understood each symbol they used, rather than assuming that word usage and word understanding go hand in hand, as is typically the case with children.

Matata was much older than the chimpanzees who had learned symbols; and her rearing deep in the forests of Congo had been very different from theirs: and they had all learned to use symbols as infants or juveniles. Nonetheless, Matata appeared to be quite intelligent and, in addition, more naturally communicative than most common chimpanzees. She had many natural means of communicating simple desires. For example, when Matata wanted to be somewhere, but was hesitant to go alone, she would take my hand and lead me with her. If she wanted something that was out of reach and there was no nearby tree, she would position my body just under the desired item so that she could climb on my shoulders to attain her goal. When she heard unusual noises in the forest, she would direct my attention toward them by looking and gesturing in that direction. If she was hun-

gry, she would point to an empty bowl, then hand it to me and push me in the direction of the refrigerator.

Matata clearly possessed the idea of purposeful communication, and I could not escape the impression that she often vocalized to attempt to tell me things—things I did not understand. I know that I certainly vocalized to tell her things that she did not understand. Thus, each of us remained locked into communication systems that worked with our own species but did not work at all between us. I wanted to learn more about her communication system, but she did not know how to teach me. Likewise, she wanted to learn more about my communication system, but I did not know how to teach her. To overcome the barrier between us, I and other scientists had endeavored to employ a visual communication system with apes. By pointing to visual symbols, we could avoid the problems inherent in asking apes to produce speech sounds.

Scientists who have studied the configuration of the ape's vocal tract have concluded that it is impossible for them to speak as we do. The human and ape vocal tracts differ in a number of important dimensions. The human vocal tract curves downward at a 90-degree right angle, just at the point where the oral cavity merges with the pharyngeal cavity. In contrast, the ape vocal tract slopes gently downward. The right angle of the human vocal tract is a necessary extrapolation of our upright posture and the consequent vertical positioning of the head over the spinal column. If our head were tilted forward, as is that of a chimpanzee, we would not be able to maintain our balance easily while walking upon two limbs.

As the hominid head became vertically balanced on the spine, the tongue and the attachments of the larynx at the base of the tongue moved lower into the neck. This reorientation of the vocal-laryngeal tract led to critical differences between the human and ape vocal apparatuses. The lowering of the larynx resulted in the ability to produce lower-pitched, more discriminable vowel sounds. The sharp angularity of the vocal tract and the decrease in the size of the mouth resulted in the ability to completely close off the nasal cavity from the oral cavity (velar closure).

Very young children and apes, as well as persons born with a cleft palate, lack the ability to effect velar closure. Consequently, they can drink liquid and vocalize at the same time—something a slightly older child cannot do without choking. But they cannot speak. Older children and adults, by bringing pressure to bear on the velar palate, can keep water from coming into their nose and lungs, while they are swimming. They also use velar closure to produce nasal sounds such as "m" and "n." Velar closure also permits the vocal tract to implode enough pressure to produce plosive consonants such as "k" and "g." Such consonant sounds are critical to all human languages.

Although languages differ in the specific consonant sounds they employ, no human language is composed strictly of vowels. Therefore, all human speakers must be able to effect velar closure in order to produce language. Consonants are much easier for our ear to discriminate. A language composed only of vowels would have so many that sounded alike that it would be difficult to tell what a person was saying. Consonants solve that problem for us in that they permit us to construct a very large number of minimally different sound units that are easily discriminated by our ears. It is the ability to effect velar closure that makes it

possible for us to produce so many discriminable sounds. But the structure of the vocal tract also means that humans, unlike other mammals, cannot breathe and swallow at the same time. We have to stop breathing for anywhere from 0.5 to 4 seconds in order to swallow; if we don't do so, we will choke to death. This situation has necessitated a degree of respiratory control in humans that appears to be absent in other animals. We use this respiratory control, essential to our survival, to engage in highly controlled phonation or sound production.

It is often assumed that a language could be made up of any sort of sounds and that animals could have their own languages made up of their own sounds. However, there are some basic constraints that necessarily operate on any potential vocal structure attempting to produce a language:

1. The sounds must be easily discriminable by the auditory system of the intended recipient.
2. The sounds must be easily and rapidly produced.
3. The sounds that are produced must be recognizably similar in some essential pattern, even though they are produced by animals of different ages and different sizes.

Recent research on the discriminability of sounds has shown that vowel sounds are far more difficult to tell apart at their boundaries than consonants.[1] Vowels seem to have "fuzzy edges." This means that it is difficult to determine the exact point at which, for example, an "ah" sound becomes an "eh" sound, much as it is difficult to say precisely when a red color becomes a pink color. Consonants, in contrast, have "sharp edges." We can easily tell when a "ba" sound turns into a "da" sound, just as we can quickly tell a figure composed only of acute angles from one composed only of curved angles. The topographic maps in our visual cortex are organized to permit precisely the angularity-curvature sorts of boundary distinctions we find easy to make. In contrast, the perception of color is a graded event, produced by the mixing of three different chromatic receptors. There are no receptors uniquely designed to discriminate pink from red; hence, we perceive no sharp boundary between them.

Because consonants are easy to tell apart, we can employ them in our speech to form the perceptual edges around vowels. This permits us to encapsulate units of sound into neat, clear packages that can be readily discriminated by others. The capacity to produce discriminable sound packages that can serve as the building blocks of the open-ended sound-based communication system has permitted the emergence of what we call language.

Surprisingly, it is not only human beings who find consonants highly discriminable. Many other mammals display a similar capacity to discriminate consonants relative to vowels. However, other animals are unable to form consonants in their vocal tracts, even though they can hear and discriminate them. The only sounds that most other mammals can produce are vowellike in quality and consequently are "fuzzy edged."

However, just because apes lack the requisite anatomical equipment to speak, it does not necessarily follow that they also lack the intelligence to use language. In the late 1960s and early 1970s, several separate research groups attempted to

Kanzi traveling with me in the forest. When I supported his weight and carried him in an upright bipedal position, this freed his hands for things other than clinging. He spontaneously began using gestures to show me which direction to take.

get around these anatomical limitations by a number of different means. Some attempted to use gestures. But gestures, like sounds, proved difficult for apes because the anatomy and motor control of the human hand is much superior to that of the ape hand. The ape's hand, like the position of its skull relative to the spine, is that of a quadruped. Apes need their hands for walking, so they develop large calluses on the backs of their knuckles; these calluses severely limit efficient hand and finger movements.

Duane Rumbaugh attempted to circumvent the anatomical limitations of the ape by using the equivalent of written symbols placed on a computer keyboard. As a substitute for vocalizing, they could simply touch a word. This method did not even require that they be able to hear differences between words. Each symbol was visually distinct and became bright whenever it was touched. Touching a symbol was thus intended to be the equivalent of speaking a word.

In order to "talk," apes had to become sufficiently familiar with the visual appearance of the symbols to be able to tell them apart. They also had to remember what each symbol looked like so that they could select it whenever they wished. This visual touch system was first employed with a common chimpanzee named Lana. Lana was raised surrounded by colorful symbols called lexigrams. The lexigrams were arranged on a computer keyboard, and Lana could—by pressing them in the proper sequence—turn on music, watch slides, open a window, cause food and drinks to be dispensed, and invite people into her room to visit and play.

Lana rather quickly learned to discriminate these symbols and to sequence them in simple stock phrases such as "Please machine give M&M," "Please person give piece of bread," "Please machine make window open," "Question person move into room," and so on. She could even recombine these stock phrases together into new ones that she had not been taught, such as "Please person move M&M into room."

The success of this approach led to studies with two additional chimpanzees, Sherman and Austin. These apes were raised in an environment similar to Lana's except that instead of using symbols to activate a machine, they learned to use symbols to communicate with each other. They could ask one another for simple tools that were needed to extract food from especially designed containers; they could tell each other what kinds of foods had been hidden while only one of them was watching; and they could use their symbols to announce simple intentions, such as where they were going, or what they intended to take from the refrigerator or toy cabinet. Unlike Lana, Sherman and Austin used symbols to communicate not only with people but also with each other. To do this, they had to be able not only to talk but also to listen, understand, and cooperate. They had to coordinate their communications, take turns in simple conversations, and coordinate nonverbal gestures with their symbolic messages.

Unlike these common chimpanzees, Matata found lexigram symbols extremely difficult to master. She could not even tell one from the other. Consequently, a task was devised for Matata to get her to pay attention to lexigrams and so to see that each one looked different from the others. One of Matata's favorite foods was bananas, so we placed the "banana" symbol on her keyboard along with some other nonsense-symbols. Each time Matata pressed the banana symbol, she received a piece of banana; then, the banana symbol and the nonsense-symbols all moved to a new location. Whenever Matata wanted another bite of banana, she had to look at the keyboard and find the banana symbol in a new place among the distractors. When she was able to find the banana symbol in this way without error, other food symbols were similarly introduced.

By this time, Kanzi was about one year old and big enough to get in his mother's way. He did not hesitate to take the bananas, apples, or raisins that she had worked so hard to earn, nor did he hesitate to slap any symbol that attracted his attention while his mother was patiently searching for the correct one. Every time Kanzi touched the wrong symbol, Matata's keyboard automatically relocated all the symbols, forcing her to begin her search all over again.

Kanzi also managed to cause problems for Matata by doing gymnastics on her head and shoulders while she tried to locate the symbols, often knocking her hand away from the keyboard just as she was about to touch the correct symbol. Matata, like most other bonobos, was a study in maternal patience. Clearly, she was not happy with the difficulties her son caused and would often scowl at both him and me. However, she never punished Kanzi at this age nor stopped him from taking her food. As he grew older, it became apparent that her extreme tolerance could not last forever—but for the first two and one half years of his life, Kanzi was permitted to do virtually as he pleased, both by his mother and by myself and others who worked with him.

taught to use similar lexigrams, could easily name colors and objects. Ai could count to seven, and Lana could appropriately use the symbols "more" and "less" to answer questions about quantity. Ai was even able to "construct" some symbols from their individual parts with the help of a computer that superimposed the pieces on one another as she touched them.

All the common chimpanzees—Lana, Sherman, Austin, and Ai—attained vocabularies of between fifty and one hundred and fifty symbols, which they employed in rather sophisticated ways. By these standards, Matata was quite backward. In fact, her progress was so dismal we were fearful that it would be difficult to justify continued inclusion of bonobos in our research program.

The overarching goal of the research program undertaken by our center had been the development of technologies and teaching strategies designed to facilitate the learning of language by persons with mental retardation. Funds for this work had been made available by the National Institute for Child Health and Development (NICHD) since the early 1970s, when the project had begun with Lana and a very small keyboard. At that time, no one knew whether or not chimpanzees could use complex visual symbols in even the simplest fashion. But Lana rapidly learned to use them to request foods and drinks from vending devices that were linked to a small computer-controlled keyboard in her room.

Research studies with Lana, and later Sherman and Austin, provided a strong foundation of basic knowledge about language acquisition. Through this work, we began to define the fundamental building blocks or units of language. We also began to apply these principles to the language instruction of mentally retarded children.

We found that while it was easy to get chimps to use symbols in a way that looked like language, it was much more difficult to get them to understand and use symbols in a manner that was truly equivalent to that of young children. To do this, apes would have to develop the capacity to comprehend words, to attend to others, to take turns speaking, and to recall their symbols completely—whether the referent is present or not. They would have to learn to separate symbol use from reward or immediate gratification so that their speech could function to convey information. For all these abilities precede the formation of grammatically complex sentences (see chapter 2).

It had been our hope that by studying a different ape, the bonobo, additional insights into the mysteries of language would be achieved. Because bonobos employed more elaborate gestures in the field, it seemed possible that they had evolved a greater capacity for language than chimpanzees. It was even possible that they utilized a simple language in the wild that no one had been able to recognize. I had been optimistic that Matata would outpace all of the chimpanzees who had learned symbols. She was a willing student who worked very hard, but after two and one half years of effort, we were forced to conclude that she was not going to fulfill our expectations. Even more disconcerting, as far as funding prospects were concerned, nothing really new about language acquisition had been learned from Matata's failures.

Mother and Child

Even though I was disappointed with Matata's halting linguistic progress, I was nonetheless fascinated by the complexity of the relationship that was evolving between mother and son. It was characterized by tolerance and understanding. In fact, during the first four to five years of his life, the only form of discipline I ever observed Matata impose on Kanzi was to encourage him to settle down at nighttime. Every evening, she began a solemn ritual of building the perfect nest. Since she was not in the forest and lacked access to the tree branches that would normally serve as bedding material, we provided her with five to seven large, rugged blankets made of heavy carpet.

Matata had very definite ideas as to how these blankets should be arranged before sleeping. Each one was taken to a high location, where she carefully straightened it and laid it down. Then, while seated on it, she artfully pulled its edges into a half-circle around herself. She repeated the process with each blanket, assiduously intertwining their edges until she had formed a nest with high cushy sides, something like a large inner tube with a soft center. Next, she reclined in this structure to test it out, and made any adjustments or repairs that were needed. Finally, she groomed herself and Kanzi before dozing off to sleep.

Kanzi, like many children, was never ready to go to bed when Matata was. He always wanted to stay up and play, and he would try to pull Matata's blankets into his own "play nest"—where the blankets ended up on top of his head as often as underneath him. He would also flop on Matata with a full play face, smiling and laughing while waiting for Matata to play bite and tickle him. After being so indulged for fifteen to twenty minutes, Kanzi usually nursed and then went to sleep as Matata groomed him. As he grew older, however, he wanted to continue playing even after he had nursed. He also wanted more of Matata's blankets for his playnesting activities, which became ever more vigorous, though never serious. He would begin twirling, pirouetting, and brandishing his blankets about right next to Matata as she was attempting to quietly and perfectly arrange her nest.

By two years of age, Kanzi was large enough that these nightly nest antics seriously began to bother Matata. Often I would stay as she settled down for the evening. On these nights, she always invited me to sit in her nest once it was properly constructed and groom with her. While we groomed, Kanzi would display his acrobatics, which were always punctuated by flinging himself with great abandon either onto my head and shoulders or into my lap.

Every time I began to groom Matata, Kanzi became more desirous of attracting my attention, so he would increase the number and vigor of the flips, flops, turns, and spins designed to do so. When Matata could bear the distraction no longer, she would take Kanzi's hand or foot into her mouth and, using her teeth, slowly begin to increase her pressure until Kanzi looked at her and realized that she was serious. This would cause him to quiet down for awhile as he puzzled over what it was that had so irritated his mother. Eventually, however, he would begin twirling and spinning again until Matata reminded him, with unquestionable firmness from the pressure of her teeth, that she was not happy with this

behavior. Finally, Kanzi would figure out that Matata was not going to tolerate anything but quiet behavior in the evening nest and then he would become quiet and allow himself to be groomed. When Matata finished her evening grooming, she would tuck Kanzi into her inner tube–shaped nest and repair the sides, using the blankets from Kanzi's play nest. She would then give me a little hug followed by a gentle shove and stare directly at the door to indicate that it was time for me to go.

A common frustration in attempting to teach symbols to Matata while Kanzi was around was her insistence that, in most endeavors, Kanzi be permitted to have his way. Matata did not mind when I intervened to reprimand Kanzi for something she also thought he should not do, such as disturb our evening grooming session. However, she made it perfectly clear that I was not permitted to make any decisions regarding how Kanzi was otherwise allowed to behave.

Thus, if Kanzi jumped in the middle of a large bowl of food that I was preparing—something Matata herself would never do—that was all right, as Kanzi was simply playing and did not intend to spill things all over the floor. Or, if I was attempting to arrange some toys or test objects, it was okay for Kanzi to flail about in the midst of these materials until he had scattered them all around the room, or to steal my pen and paper and run away. Again, Matata herself never thought of misbehaving in such a fashion, for she was well aware that such things bothered me. Yet, from her perspective, Kanzi was not really attempting to challenge me with such actions, he was just carrying them out in jest.

Nonetheless, Kanzi was quick to recognize when I was irritated and to solicit Matata's support if I tried to take back my pen or insist that he pick up the things he had just scattered all over the floor. He felt compelled to explore with considerable elan all dimensions of behaviors that were "okay" with Matata but frustrating to me. This exploration of behavioral options as interpreted by me versus Matata often became Kanzi's raison d'etre for an entire morning or afternoon. Whenever I grew exasperated and raised my voice to insist that he pick up something he had just thrown on the floor, he would yell for Matata to come. She would then lumber over with a suspicious look on her face and attempt to determine what was going on between me and Kanzi. He would vocalize to try and convince her that I was requiring him to do a dastardly thing, while I would attempt to show her the mess that Kanzi had made and proceed to insist that he rectify the situation. Matata would then watch me cautiously, allowing me to continue only as long as Kanzi did not become too upset or run to her. Since his goal was to test me, he usually did not run to Matata, nor did he get really upset—he only got just upset enough to cause his mother to stay there and keep her eagle eye on us both.

Potty training proceeded in much this manner. Potty training an ape is much like potty training a child. One simply picks them up and takes them to the potty at what appears to be an appropriate time. The trick is to watch closely and select the times wisely. Matata had not been potty trained, as she was far too large to pick up and carry to the potty, so she saw relatively little need for me to potty train Kanzi. Moreover, the one thing young Kanzi liked least of all was to be asked to sit quietly in a single location. He was quite content to be carried to the potty but unwilling to stay long enough to calmly accomplish what I intended. Matata

sympathized with him, apparently assuming that sitting on the potty was an unusual form of punishment that I had invented for her son. So Kanzi would stay on the potty only for as long as I could cajole and entertain him. Our progress in this endeavor alternated between exceptionally slow and none at all as long as Kanzi remained with Matata. As with many other things that I had tried to teach Kanzi while Matata was there, he understood what I wanted him to do, but saw no reason to do so; therefore, he frequently elected not to use the potty.

When Kanzi was almost two and one half years old, the Yerkes Center decided that Matata should be bred with Kanzi's father Bonsondjo and become pregnant. Like the females of common chimpanzees, bonobo females experience a swelling of their genital tissues when they are sexually receptive. The timing of their sexual cycles is similar to that of the human female, but differs in that it is visually advertised to all by the engorgement of genital tissue. After they give birth and while they are lactating, bonobo females do not experience these swellings, nor are they able to conceive. (Like human females, however, and unlike all other nonhuman primates, bonobo females continue to engage in sexual interactions during this time.)

Since it was important that Matata be separated from Kanzi for as brief a period as possible, she was given a medication that caused her to slowly stop lactating before being sent to join Bosondjo. It was hoped that this medication would aid her quick return to sexual cyclicity and that when she joined him at the field station she could conceive quickly and return to Kanzi.

Fortunately, for several months before Matata was to leave to join Bosondjo, Kanzi had begun to permit us to carry him out of her sight. In fact, he even allowed us to leave Matata on what we called the "chimp side" of our research center and traveled with us to the "childside" where work was in progress to teach children with retardation a language using a keyboard similar to Matata's. Of course, Kanzi could not play with any of these children, but he much enjoyed watching them play from a distance, just as children like to go to the zoo and observe apes from a distance. Matata objected vociferously when Kanzi left to go on these short visits, but to my complete amazement he paid her no mind and went anyway. He seemed to trust me to take him back to his mother when he asked and was quite willing to go almost anywhere with me.

When the time came to sedate Matata and take her away in a small cage, we did not want Kanzi to have to watch; so we arranged a visit to the childside, and while Kanzi was out of eyesight and earshot, Matata was tranquilized and whisked away. When Kanzi returned from his visit to the childside, he seemed to think that Matata must be hiding somewhere. He did not vocalize or cry out in distress at all, but he asked to be carried to every room in the laboratory over and over. In each room he looked in the cabinets, under the furniture, behind curtains, on shelves, under the blankets, out the window, and so on, as if he was bound to find Matata at any moment. He evidenced emotional distress only once, when I stepped out and left him with another caretaker to go home and get some food. He became so upset at my departure that I remained with him day and night for the next three days. By that time, Kanzi seemed to have given up looking for Matata and had decided that the milk we offered, while not as good as Matata's, was ac-

ceptable. I was then able to leave him for brief periods of time with Liz and Kelly, two of Matata's other teachers and friends whom he had known since he was six months old.

Kanzi Had Been Keeping a Secret

Even though Kanzi was preoccupied with his search for Matata on the day of her disappearance, he still managed to use the keyboard a great deal. To everyone's astonishment, on the first day of Matata's absence, Kanzi produced 120 separate utterances using twelve different symbols ("banana," "juice," "raisin," "peanuts," "chase," "bite," "tickle," "orange," "outdoors," "swing," "cherry," "sweet potato," and "ball"). Prior to Matata's absence, we had been encouraging Kanzi to use the keyboard and, consequently, had added lexigrams such as "ball" and "chase" that might prove of interest to him. However, his usage of symbols had been rather sporadic, and we were not certain how many symbols, if any, he really comprehended. For example, the day before Matata left, Kanzi used the keyboard only twenty-one times to ask for just three different foods. That day, Kelly, one of Matata's teachers, made the following observations of Kanzi's keyboard usage:

> Kanzi is playing with a ball—I initiate an interaction with him saying "ball" and begin to slap the ball. When I stop he wants me to continue. I wait for him to request this at the keyboard but he has difficulty finding the symbol. I touch "ball" while he watches, then he touches "ball" and we play again. He then says "orange" and gestures for me to take him to the cooler. I get an orange out for him, but he calls it "banana" when we return to the keyboard.

The following day, when his mother was gone, we saw a very different Kanzi at the keyboard. Not only did he use many single symbols appropriately to tell us what he wanted to eat or do, he formed the combinations "raisin peanut" when he wanted both foods, "sweet potato tickle" when he wanted both to eat sweet potatoes and be tickled, and "melon go" when he wanted to go outdoors with some melon. He even touched "juice" simply to comment on how happy he was that I had given him a very large glass of grape juice, his favorite drink—carefully holding it so that it would not spill while walking all the way across the room to make this comment at the keyboard.

Kanzi had been keeping a secret. He had been learning these words all along, but had never used them in a reliable manner. We thought he did not know how to talk with the keyboard, but he did.

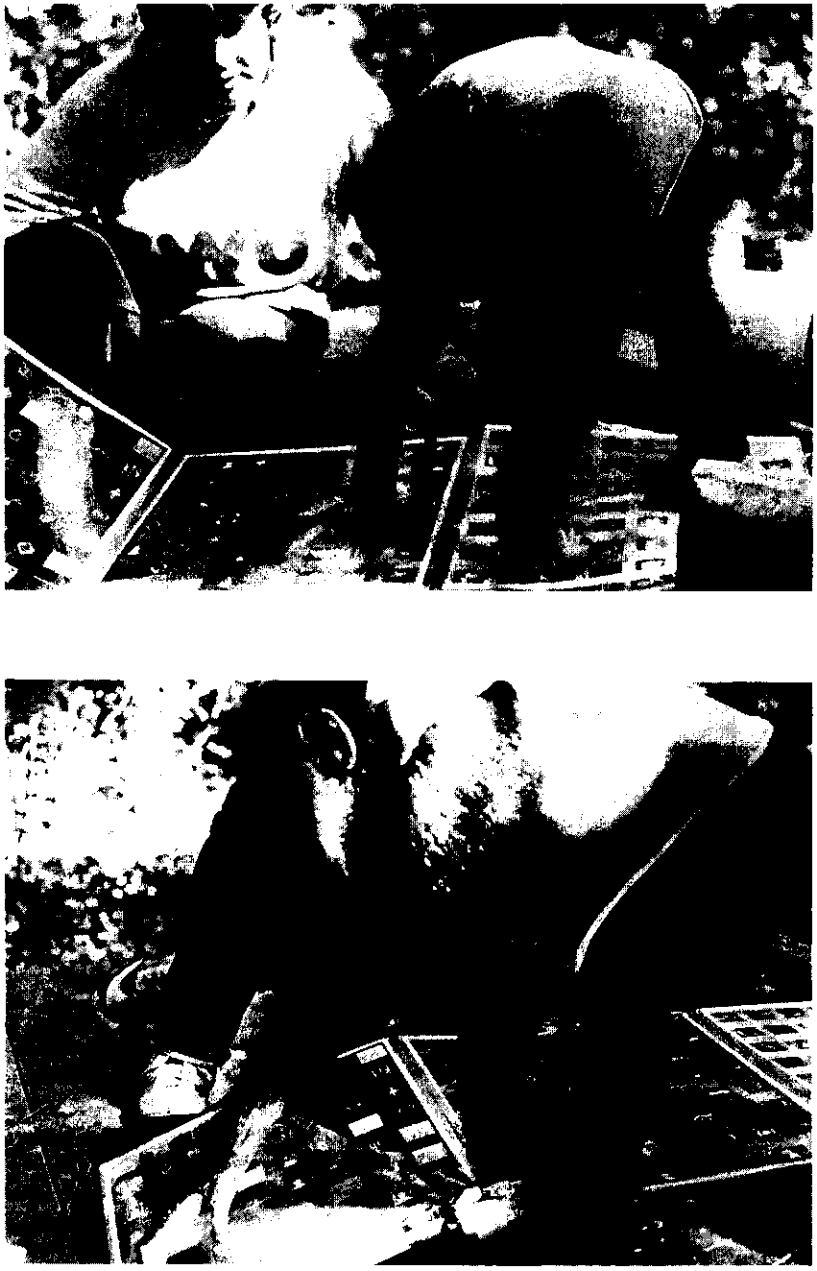
Simultaneously with this abrupt appearance of competent language skills, a similar thing happened with regard to Kanzi's use of the potty. Whereas he had previously appeared to have a great deal of difficulty remembering to use the potty, upon Matata's departure we suddenly had a well-trained young bonobo. I mention this not because it is significant that a bonobo could learn to use the potty, but because the sudden appearance of this behavior was, like his ability to talk, a clear indication that his previous performance had been a reflection not of his knowledge but of his motivation.

Kanzi diligently searches for just the lexigrams that he wants.

Matata's sudden absence caused Kanzi to become extremely attentive to the kind of things that I and his other teachers had been attempting to show him. With Matata gone, we were suddenly the most important individuals in his life, and his desire to please us increased commensurately. No longer did he have to choose between his mother's view of potty training and ours or between her attitude toward using symbols and ours. Our "human perspective" prevailed because it lacked competition from Matata. It became increasingly clear that Kanzi had learned a great deal more about how we did things than he had bothered to demonstrate in the past. Now, with Matata gone, all of what he had learned, but rarely if ever displayed, came pouring out of him.

I had originally intended to use the time during Matata's sojourn to begin systematic instruction with Kanzi, making certain that he could both use and understand symbols. I had hoped to expand his vocabulary, make certain he could select pictures to go with symbols, and enable him to take so-called "blind tests" so that any statements I wished to make regarding what he had learned would be acceptable to other scientists. Lana, Sherman, and Austin had previously achieved each of these milestones, and Kanzi needed to do so too, I believed, if we were to make additional progress in our understanding of the process of language learning.

Blind tests are essential because apes, like people, sometimes select the right answers for the wrong reasons. The person giving such a test either does not know the answers or is not visible to the ape when questions are presented, and thus cannot inadvertently help the ape answer the questions.



After locating the lexigrams that he wishes to use, Kanzi places the keyboard on the ground and walks across it as he forms the compound utterance "grab-chase."

Scientists have paid a great deal of attention to this issue because of a concern that very slight movements, such as a twitch of the eyebrow or a nearly imperceptible nod of the head, can cause the ape to get the right answer without really knowing the symbol. Given simple and highly practiced tasks, such covert cues can be effective, and therefore misleading. However, in order to cue a subject when many different words or answers to a question could occur, the experimenter would need to develop a specific subtle movement to be associated with each symbol. To present many different subtle cues reliably, one would have to be purposely intending to cue the ape at just the right time and do so throughout a test of many trials. Only if the scientist intended to cheat or defraud his colleagues would subtle cuing be possible when long tests with many different alternatives were presented.

Apes, like humans, are astute observers of direction of gaze, and when the experimenter looks directly at an answer, if the answers are far enough apart, sometimes the ape can determine the answer by noting where the experimenter is looking. Of course, it is easy to tell if the ape is depending on your gaze. If you look intentionally at the wrong answer and consequently the ape makes an error, he has probably used your gaze as a cue.

My goals for Kanzi were ambitious, and I would have been gratified had he made only partial progress toward taking such tests during Matata's absence. Realistically, I was also prepared for him to go through a traumatic period of adjustment to being without his mother, during which time I assumed he probably would not be able to learn anything. When he began, instead, on the very first day of Matata's absence, to use the keyboard far more frequently than he ever had, to form combinations of symbols, and to tell me not only what he wanted me to do for him but what he *planned* to do next, I was in a state of disbelief. It was several weeks before I and others working with Kanzi began to accept the fact that he had really learned to talk even though we had not been attempting to teach him. As this realization grew, I concluded that I had to strive to rearrange the entirety of my thinking as to what language was, what animals were, and what it was I should be attempting to learn from Kanzi.

Here was an ape who was really "talking" to me. It was not just that I had successfully taught him how to use symbols to stand for things so that he could convey his desires effectively, as I had done with Sherman and Austin. I had not intentionally taught Kanzi anything, nor had I been able to teach his mother what he had somehow learned, even though I had been trying daily to do so for two years. What was happening?

I searched back through all of the notes that I, and others, had made during the past two years, looking for any hint that somehow Kanzi had been learning language all along. How could I explain to skeptics what I had done to foster Kanzi's language learning when I did not even know it was happening? Not only had I not documented anything *I did* to facilitate Kanzi's accomplishment, I had no real record of what *he had done*. One always hears stories of children who do not talk until they are three years of age or older, then suddenly begin to speak in complete sentences, never passing through the stages of babbling, baby talk, single-word utterances, and ungrammatical sentences that characterize the early stages

of language learning in other children. Well, now I had a similar story to tell, only it was not about a child, it was about an ape. And the ape was not speaking but was using printed symbols—the equivalent of learning to read and speak at the same time. From the moment the enormity of what Kanzi had done became clear to me, I knew that I would not be believed.

Kanzi was an animal, and animals were not supposed to be able to just grow up like children, learning whatever the people who raise them expose them to. Unlike people, who possess a sense of self-consciousness, a morality, and presumably an innate capacity for language and rational thought, animals are supposed to be different. While some of them are thought to be "clever" and quick learners, it is not assumed that they can really decide for themselves what to learn and how to learn it.

If helped along by psychologists who reinforce the right behaviors, it is known that some animals can be made to appear intelligent. Pigeons, for example, can be taught to play a simplified version of basketball. But language is not a game of basketball, and Kanzi's utterances had not been carefully programmed into his repertoire of behavior. Indeed, they had not even been practiced. We could not have reinforced Kanzi's actions, nor selected certain bits of his behavior to amplify, because his learning was not taking place in the form of visible actions. It had been occurring covertly; Kanzi had been watching, looking, listening, and learning just as though he were a young child. And when, because of his mother's absence, it became propitious to utilize what he had learned, he elected to do so.

In spite of his abilities, Kanzi was not ready to take a blind test. Indeed, he was not ready to take any test at all, blind or otherwise. He was happy enough to use the keyboard to talk, but he had never previously been required to sit still and answer a lot of questions that, from his perspective, were meaningless, in order to earn a morsel of food. When I tried to encourage him to participate in such a test, he evidenced no willingness at all to answer any questions. Like any normal two-year-old child, he wanted to do what attracted him at the moment. Moreover, anything that I insisted he do became precisely the thing he would refuse to do.

Short of starving Kanzi, there was no way to get him to agree to participate in a formal test of his skills at this point. Certainly, we were not going to withhold food, as our utmost concern just then was to get him to eat well even though he was concerned about Matata's absence. We could not risk traumatizing him or fostering the onset of depression by asking him to do without food in addition to being without his mother. Consequently, it seemed better to focus on ways of fostering his language development rather than rush to "verify" what he could do. Certainly, if he was as competent as I believed him to be, there would be ample time in the future to document his capacity.

Not knowing what I had done to permit Kanzi to learn what he had, I knew even less about what to do for the future: One thing was clear: Since we had not taught Kanzi symbols, but he had learned many of them anyway, we did not need to focus on explicit instructional attempts in the future. Indeed, such attempts could inhibit progress rather than facilitate it. Only Kanzi knew what he was ready to learn and what he wanted to learn. We could do little more than guess. Thus, I decided to abandon all instruction and focus my attention instead on what was *said to Kanzi* rather than on what we could teach him to say.

I, along with Kanzi's other caretakers—Rose, Kelly, Liz, and Jeannine—tried very hard to help him understand everything that was said to him. We also left whatever he chose to say completely up to him. In a sense, then, we provided a linguistic framework for Kanzi. Yet the keyboard had so few symbols that spoken words really comprised most of this linguistic framework. Because Kanzi was not able to produce the consonants and vowels that comprise speech, however, we accompanied our words by pointing to any appropriate symbols that were on the keyboard when we talked to him.

On the first day Matata was gone, Kanzi had used all twelve symbols on the keyboard; therefore, it seemed important rapidly to increase the number of symbols available to him. I wanted to add words that I knew we would want to say to him, as well as those he might wish to say to us. But what would a young bonobo elect to talk about? Since I was going to teach him not symbols now, but rather a language model and look at what he learned, I could not just select a symbol and proceed to make certain that he differentiated it appropriately from the others. It would be up to him whether he bothered to learn it at all. How was I to know what he would bother to learn? The only clue I had to follow was the knowledge that field researchers had gathered regarding the behavior of apes in the wild.

Morning Exploits

Kanzi's day typically started whenever he awoke. Jeannine was usually the first to arrive; after relieving whomever had spent the night with Kanzi, she would begin straightening up the group room while waiting for Kanzi (who was still asleep in the bedroom) to awaken. Kanzi often announced that he was awake by using his keyboard to say something to Jeannine. On one typical morning, for example, Jeannine heard "peaches" and then "hug" and knew what Kanzi wanted. She prepared him a bowl of peaches, took them into the bedroom, and gave Kanzi a big hug while he happily consumed them.

After finishing his peaches, he invited Jeannine to play "keep-away" with the rubber band by making the sign for "grab" (touching his knuckles to his wrist) and lighting the "rubber band" symbol on the keyboard. Kanzi was so good at keep-away games that he nearly always won. He would give the other party plenty of chances by pretending to drop the item near them or pretending that he had forgotten the game and that he had laid the item down while attending to something else. But the second you reached for the item, Kanzi was there to grab it from under your very nose. Anything could suffice as the item to be "kept away"—from the most desirable food or toy to the most insignificant little stick or rock—since the point of the game for Kanzi was not really to keep something away, but just to play the game—that is, to demonstrate just how good he was at keeping things from us. Kanzi invented numerous variations on the basic keep-away theme, from hiding the item to pretending to swallow it in the midst of the game. Keep-

away games with food items were his favorite, because he could actually make the item disappear bit by bit. The game was not over until the food had completely vanished; depending on how much Kanzi was enjoying the game, this could happen quickly or very slowly.

When Kanzi finally tired of the keep-away game, he asked Jeannine to take him to the group room by first pointing to the keys in her pocket, then to the lock on the bedroom door, and then toward the group room. Many of Kanzi's complex communications entailed the use of multiple gestures such as these. He invented simple gestures that he needed on the spot to get his message across, often combining such gestures with vocalizations and lexigrams as well.

Kanzi began employing gestures when he was less than one year old. His first gesture was used to indicate to whomever was holding him that he wanted to go somewhere. This gesture consisted of extending his arm in the desired direction of travel while being carried. The development of this "go" gesture was facilitated by the fact that Kanzi wished to be carried much of the time by human companions rather than his mother. We walked bipedally and supported Kanzi's weight with our arms. This left him free to use his hands for whatever he desired rather than clinging, as he had to do when Matata carried him. Not only did Kanzi experience this unusual early opportunity to learn to use his hands for something other than clinging (early, that is, for a bonobo infant), but also any gesture which he

Kanzi plays a game of "stick-keep-away" with an experimenter who is lying on the ground to the left. The experimenter is trying to get Kanzi's big stick with his little stick.

Kanzi was later joined in this travels in the forest by a younger sibling Mulika. Here, Mulika at one year of age, is learning lexical symbols. Like Kanzi, she insisted in riding on our shoulders as we traveled in the forest.

did make was responded to by human companions who wanted to encourage the development of his communicative skills.

When Kanzi grew old enough to ride on Matata's back, he often used his "go" gesture to ask Matata to travel down an outdoor trail by extending his arm in front of her face as he rode on her back; or if she paused to rest when he wanted to continue traveling, he would communicate this to Matata by gesturing "go." Of course, Matata had a mind of her own, too, and she would not always comply with his requests. Certainly, she must have been the only ape mother in the world who had an infant who attempted to give her travel advice.

Most of the day, wild apes travel about the forest in search of food. Little is known about how, if at all, they plan their travels or whether they communicate any such plans to one another. However, they are able to make good use of the forest's resources and seem to have an intimate knowledge of plants and their fruiting seasons. Therefore, I decided to try and build Kanzi's vocabulary around the activities of traveling and locating food in the forest. We were fortunate to have available fifty acres of primary forest adjacent to our laboratory. Within this tract of land were many small mammals, such as raccoons and rabbits, and small reptiles, such as lizards, snakes, and turtles. A river bounded the forest on one side, a golf course on another, and undeveloped land on the remaining sides. Edible plants such as muscadines, blackberries, strawberries, and onions grew wild. Because Atlanta lies in a temperate zone, all the vegetation in the forest was sea-

sonal, and during a number of months each year it was too cold for an ape to be outdoors for more than ten or fifteen minutes. However, in the spring and summer months, the forest was somewhat similar to that of the tropics.

A series of trails were laid out in the forest. In place of fruiting trees, I established locations where coolers were placed containing one or more foods; the foods found at each location did not vary, since in the wild, a tree growing in a particular place always produces the same type of fruit. Small structures, each unique, were built at these natural stopping points along the trails. Some structures afforded minimal protection from heavy rains. Each location was given a name and a lexigram symbol. The coolers were freshly stocked each day with the appropriate food, and we began to travel about the forest with Kanzi, just as if we were a small group of bonobos searching for food in the wild.

During our wanderings, Kanzi not only gestured in the direction that he wished to travel, but when he rode on anyone's shoulders he also turned the person's head forcefully to cause him or her to look in the direction he was pointing. If this was not sufficient to change the person's course of travel, he would lean his entire body in the direction he wished to go. With Kanzi on one's shoulders, it was difficult to maintain a course in a direction that was not to his liking. Thus, people usually ended up either going where Kanzi wanted to or putting him down. At times, I felt like a horse being broken and trained by an adamant, indefatigable rider.

Instead of people using gestures to cue apes, what we had in this situation was an ape using gestures to cue people. Kanzi did not mind being subtle about his cues as long as the message got across. If not, he was also quite happy to be very blatant.

On that typical morning, when Jeannine opened the door to the group room, Kanzi raced in and began checking on everything that he had not seen in there the night before: Jeannine's bag, a load of groceries she had bought, a new toy she had laid out for him. No new object or change in location of an old object was minor enough to escape Kanzi's attention; he took in every detail of the rooms in which he ate, slept, and played. While exploring the group room, Kanzi noticed an umbrella lying on the cabinet—it had been raining that morning. He immediately picked it up and threw it across the room. The umbrella had done nothing to Kanzi to solicit such an act, but Matata was very fearful of umbrellas, and Kanzi must have recalled her fear, even though she was no longer present. Matata did not understand how they worked and seemed to think of them as strange sticks that suddenly metamorphosed into large canopies. It seemed that she simply did not like them in principle—as far as I knew she was never harmed by an umbrella. Perhaps, however, the men who captured her carried umbrellas or used nets that shot out of sticks as umbrellas do. In any case, although Matata had rarely seen umbrellas while Kanzi was small, apparently she had transferred her concerns about these unusual sticks to him.

Jeannine, noting Kanzi's action, decided to put the umbrella away in the 'T-room' and used the keyboard to announce her intention to Kanzi. He watched as Jeannine carried the umbrella into the 'T-room' and then requested to be taken to the keyboard, where he said "umbrella" and gestured toward the 'T-room.' When Jeannine took Kanzi into the 'T-room', he proceeded to look into every cabinet until he located the one holding the umbrella. He then pushed Jeannine's hand

toward the umbrella, wanting her to pick it up. Jeannine retrieved the umbrella and then put Kanzi down. Kanzi said "hide" and pointed to the umbrella, so Jeannine "hid" the umbrella again. Once it was out of sight, Kanzi said "umbrella" and gestured for Jeannine to carry him from place to place again until he found the umbrella. Kanzi played this hide-umbrella game with Jeannine several more times before he finally tired of it and asked to go back into the bedroom. During this self-initiated game, he seemed to overcome his initial fear of the umbrella. Perhaps the ability to have it put out of sight and then to find it again convinced Kanzi that the umbrella object behaved like all others in that it stayed where it was put until retrieved. It never jumped out at him or Jeannine, nor did it pop open of its own accord; thus, it appeared to be a rather trustworthy, if unusual, item.

Back in his bedroom, Kanzi lay down on the bed and said "tickle," then pointed to the flashlight to ask Jeannine to tickle him with it. Just as Kanzi liked to play "keep-away" with different objects, so he also enjoyed playing "tickle" and another game, "tag-chase," with a variety of objects. Jeannine tickled him all over his body by pressing and twisting the flashlight in various joints, while Kanzi smiled and laughed and pretended to try and stop her from tickling each new spot. Bonobos, like all apes, are much stronger than human beings and their muscles are quite dense. Thus, something that might feel a bit painful to us can bring forth loud peals of laughter from them.

Matata often tickled Kanzi by placing her mouth gently over a joint in his back, his neck, his knee, or his elbow. She then pressed down with her teeth and rubbed them back and forth, just as we do with our fingers when tickling. Kanzi loved this sort of play, and the flashlight, as Jeannine used it to tickle him, surely felt much the same as Matata's teeth. At one point, Jeannine dropped the flashlight and began tickling Kanzi with her fingers. Kanzi stopped laughing, sat up, and began to look around. Jeannine asked him if he was looking for the flashlight. Kanzi answered by saying "flashlight" at the keyboard and then began searching under the covers till he found it. He picked it up and handed it to Jeannine and again requested "tickle." Jeannine resumed her "flashlight tickles."

When they were done playing, Kanzi pointed to the door of the group room to indicate that he was ready to go outdoors. As he already knew how to get to all of the different locations outdoors but had not yet learned the symbols for many of them, Jeannine laid out an array of pictures of the various locations in front of Kanzi and asked him which one he wanted to visit. Kanzi selected the picture of the childside, on the other side of the building, then climbed on Jeannine's shoulders and gestured toward the childside. Even though he loved to travel to the new locations that were in the woods, he also liked to visit the childside where he could observe people coming and going and perhaps catch a brief glimpse of some of the children as they entered the building.

A cooler filled with apples had been located on the childside, so that if Kanzi became hungry, he could munch on apples while he watched the people go by. As Jeannine headed toward the childside, Kanzi gestured to the keyboard to indicate that he wanted to talk. Jeannine stopped and, with Kanzi still on her shoulders, held the keyboard up above her head so that Kanzi could speak without having to get down. Kanzi commented "apple," indicating that he recalled the type of

food that he had found on the childside during earlier visits and that he hoped to have some more of it. Jeannine agreed and carried Kanzi to the apple cooler, where Kanzi helped himself as he watched the people passing by—a serviceman who was there to fix the air conditioning, the mailman, a student dropping by to ask about a job, and two mothers coming to learn how to use keyboards with their children. Only the serviceman noticed Kanzi, and he seemed to think that Kanzi was just an exotic pet Jeannine was showing off.

Since it is against the policy of the research center to allow anyone other than employees to approach apes, Jeannine waved the serviceman on when he began to come closer to look at Kanzi. Kanzi was very interested in the serviceman because he wore a lot of tools around his waist and because he kept going in and out of the "mechanical room." (This is a small room located on the outside of the building that contains all the control panels for the ventilation and electrical systems of the buildings, as well as the master fire-alarm panel.) Kanzi had always been told that this room was dangerous and that no one was allowed to go in it—which was true. However, he now observed this man casually walking in and out and taking great interest in some big boxes that Kanzi could glimpse whenever the serviceman came out and left the door open. Even more fascinating was the fact that this man climbed up a ladder right through a hole in the roof of this room and came out on top of the building!

Kanzi had been gravely cautioned not to go on top of the building—which he could easily have done—for two reasons. First, none of us could readily climb up there to follow him and make certain that he was okay. Second, all the heating and air-conditioning facilities were on top of the building, and we did not want him exploring this equipment. Since it was impossible to convince Kanzi that he should not explore interesting-looking boxes, we had told him that a scary monster lived on top of the building and so it was a very dangerous place. Kanzi had believed us, and he avoided the top of the building. Now a calm, happy serviceman was walking around on the top of the building who did not seem afraid at all. Moreover, it must have puzzled Kanzi that Jeannine did not seem to be concerned that this man was on the roof, nor was she warning him about the monsters. Even more interesting was the fact that there were no monsters jumping out at this man. Needless to say, Kanzi was most intrigued by this state of affairs.

I had just seen Kanzi and Jeannine walk past my office window and realized that Kanzi was up and ready to begin his day's exploration, so I strolled out to join them. When I noted Kanzi's fascination with the man on top of the building, I became worried that Kanzi would begin to think that this was a place that he too needed to explore, in spite of what we had told him. Thus, I decided to try and say something that would indicate to Kanzi that this fellow was indeed in danger. I cupped my hand over my mouth and yelled up to the serviceman, "You better be careful, don't you know that monsters sometimes come up there on the roof," in a tone of voice that indicated I was not totally serious. And then I winked and pointed to Kanzi. I was trying to say, "Play along with our game and pretend that you are being careful and watching out for those monsters."

Such indirect techniques of indicating pretence are often used between adults in the presence of children who are old enough to understand if one adult simply

asked another adult to "act like you see monsters." I feared that Kanzi would have understood if I had I said to the man on the roof, "Please *act* as though you see monsters up there." So I attempted to use this indirect means of conveying the pretend game. The serviceman on the roof looked down at me as though I was surely a crazy person. He could not understand at all what I was doing. Either I really thought there were monsters on the roof, or I was a complete fool running around with a monkey and acting as though there were monsters on the roof, when I knew perfectly well that this was not the case. Of course, I should have realized that my ploy would backfire, but I always made this sort of mistake because it was hard for me to remember that Kanzi did not look at all like a child to most other people.

The workman looked down at me, Kanzi, and Jeannine and just shook his head and went on about his job. That fascinated Kanzi even more. From Kanzi's perspective, I had actually told the serviceman to watch out for the monsters, yet he did not seem at all frightened. Perhaps I was wrong: perhaps there were no monsters on top of the building after all. It also seemed that Kanzi understood that my tone of voice somehow signaled less concern than the situation would have merited had there really been monsters on the roof. Kanzi seemed to be beginning to make judgments not only of what I said, but about *how* I said it, and when there was a dissonance between these two states of affairs, it aroused his suspicion of my veracity.

My heart sank, as I knew that in the not-too-distant future we would see young Kanzi determined to carefully explore the top of the building to find out whether there were really monsters up there or not. A perfectly good and reliable means of keeping Kanzi out of mischief on the roof was spoiled because the world as we portrayed it to Kanzi and the world as it really was were not the same. I suppose it is inevitable that someday a person will go up on the roof and no monster will appear.

It was not that I had wanted to lie to Kanzi, only that I could not explain to him—in a way that he could understand—*why* boxes loaded with air-conditioning and heating equipment were dangerous or why he should not go someplace that I could not readily follow. Kanzi was not thinking about testing the roof today, however, as he was a little scared of the serviceman himself. Thus, I took note of the incident and tried to figure out a plan for the future. I could, of course, always put Kanzi on a lead, but I wanted to avoid doing so for as long as possible, since the more freedom Kanzi had, the more he encountered and elected to talk about at the keyboard.

Once the workman had finished the repairs, packed all of his tools in his truck, and left, Kanzi decided that it was time to go somewhere else. He turned and tugged at the keyboard which Jeannine was carrying to let her know that he had something to say. When she opened the keyboard and placed it on the ground in front of him, he carefully touched the symbol "Austin" and then directed his "go" gesture toward the area where Sherman and Austin lived.

Sherman and Austin were now adolescent male chimpanzees. Since we had no adult male bonobos, Sherman and Austin were Kanzi's role models, and he admired them greatly. He loved to play chase and keep-away with them; he was

especially friendly with Austin, and often asked to go and visit him. Sherman sometimes played a little rough with Kanzi, but Austin was always patient and calm. Kanzi even allowed Austin to carry him around on his back. That very first night after Matata's departure to the field station, Kanzi had even elected to sleep with Austin rather than in his new bed with me. He left me, clung to Austin, and waited for Austin to make a large nest like his mother did and then to settle down and groom. Austin, however, was not interested in making a large nest, preferring to sleep instead on a single blanket spread out on the floor. Austin also was not interested in grooming Kanzi, though he did not hesitate to share his nest and he generally entertained Kanzi by playing with him.

It seemed that Kanzi felt a need for a hairy body to snuggle up to, and although Austin did not behave much like a bonobo mother, he certainly looked more like Matata than I did. But after about an hour of trying to go to sleep with Austin, Kanzi apparently decided that something just was not right and decided to rejoin me. Even though I did not look much like Matata, I behaved more like her than Austin did. From then on, he always preferred sleeping in a bed with me or one of the other caretakers.

Taking note of Kanzi's request, Jeannine agreed to visit Austin, and Kanzi climbed onto her shoulders to be carried there. As they neared Austin's playyard, Kanzi again tugged on the keyboard, and when Jeannine opened it for him, he said "orange." Oranges were the food typically found in the cooler placed near Sherman and Austin's playyard. By asking for them before the cooler was even opened, Kanzi revealed that he remembered the food typically found there. Jeannine opened the cooler and gave Kanzi an orange, which he spontaneously decided to share with his friend Austin. He tried to push the orange through the wire to Austin, but it would not fit, so he bit it open and passed half of the orange through to a very grateful Austin.

Kanzi seemed to enjoy sharing food with Austin. He also liked to share food with me, with other people, and with the dogs that lived at the laboratory. In return, he expected us to share food with him. He wanted a bite of everything he saw someone eat, especially if they appeared to be enjoying their food. Only Kanzi was not content with a separate piece of their food, he wanted some of the food that was actually in their mouth. Sharing food, mouth-to-mouth, was something that his mother had taught him.

In the wild, young bonobos learn which foods to eat and which not to eat by tasting the food as their mother consumes it. Since they obtain food directly from their mother's mouth, they cannot make a mistake and accidentally ingest a poisonous food. However, many people who worked with Kanzi did not wish to give him food from their mouths or to take food from his mouth; they were concerned about the possibility of passing germs back and forth.

"Germs"—this was another one of those concepts (like electricity) that one struggles with mightily to explain in some reasonable manner to a doubting ape. You could tell Kanzi that you don't want a bite of that smushed banana he is dangling on his lower lip toward you—because it has little invisible things on it that might make you sick. He can't see any little things on the banana, but he can understand that you are hesitant to eat it. Therefore, he wonders why *he* should eat it. If you tell him that the banana is perfectly good but you don't want to eat it, he assumes that if the banana is okay to eat, then you must be rejecting him, not the banana. Until he was nearly seven years old, Kanzi continued to behave as though his feelings had been deeply bruised whenever someone he liked refused to take some of the food he offered from his mouth or would not let him have some of theirs.

Austin, having no germ fears, was happy to take half of Kanzi's orange. Kanzi then gestured "chase" by clapping his hands together, and Austin chased him up and down along the fence. In the midst of the chase game, Kanzi abruptly stopped and started looking at himself in the mirror just outside Austin's yard. He then began making funny faces in the mirror. First, he inverted his lower lip until it covered his chin (something only apes can do), then he sucked in his cheeks until his face looked like a large raisin. Next, he jumped up and down on all fours, simultaneously shaking his head back and forth; then he held various parts of his body up to the mirror for a close inspection—his face, his stomach, his penis, and finally his buttocks. Finally, with a big smile on his face, he began to do a bonobo "dance," which consisted of trying to shake both his hands and both his feet at the same time without falling down.

Austin watched all of this with great amusement, for he also loved to look at himself in the mirror. Austin's use of mirrors, though, had become far more sophisticated than Kanzi's little dance. Austin used mirrors to apply makeup to his face and to try out fur shawls to make himself look even larger and more intimidating than he already was. He also had figured out how to use a small mirror to redirect beams of light. When slides were projected into his room, he would cause them to bounce around from wall to wall by holding up a mirror in front of the projector and redirecting the light.

Austin enjoyed many other forms of visual play as well. When watching super-8 movies of wild chimpanzees, he would interpose his body between the projector and the screen so that his own reflection cast a chimp shadow onto the movie picture; he would then make this shadow chase the chimpanzees in the movies. He also liked to watch his shadow outdoors and would practice moving in unusual ways to change the pattern it cast. Most of all, Austin liked to watch himself on live television. When the camera was turned on him and he was given a monitor, he would begin to play the movie "ham." Two of his favorite routines were to eat imaginary food, scooping large bites of nothing out of bowls while pretending to swallow them with great gusto, and to try and shine a flashlight down his throat while directing his large gaping mouth toward the cameras. Sometimes it even appeared that he was purposely wiggling the soft palate in the back of his throat. I never understood why Austin was so fascinated with his own throat—perhaps he was simply trying to figure out why he could not speak.

When he had finished contemplating his reflection, Kanzi again asked Austin to "chase" by using the handclapping gesture. Although the primary mode of communication was visual symbols, all of the apes at the lab used many spontaneous gestures as well. They often learned these from one another. Kanzi had learned the chase gesture from Austin when he was quite young. Fortunately, Kelly had been there to see this happen. She noticed that one weekend Kanzi seemed

Kanzi uses gestures and glances to show the experimenter that he would like to have the experimenter climb the vine next to the tree that he himself is planning to climb. Youngsters often climb vines and dangle from them to play side-by-side in the air in the wild.

checked from time to time to see if they were on the yellow trail, the blue trail, or the white trail, as each was marked on the map. Kanzi certainly had no need to check the map. He not only knew the trails but the relative locations of each food site. If we agreed to go off the trail at any point, Kanzi could make a beeline straight through the woods to the location he had selected, even though he had never traveled that route before.

Kanzi's companions preferred to stick to the trails because they were cleared and easier to traverse. Kanzi, however, could easily pass through the densest of underbrush and never lose his bearing or take an unnecessary sidetrack, regardless of whether he had ever been in that part of the forest before or not. It seems rather trite to say that, in the woods, Kanzi seemed intimately at home and extraordinarily well prepared to handle almost any situation he encountered. His anatomy made it possible to negotiate high trees, muddy swamps, and dense thorny underbrush, seemingly without a care and certainly without a scratch.

Mosquitos landed on him but did not bite because their proboscises could not quite reach his skin as they stood on the layer of coarse hair that covered his body. (Apes do not have fur but have bodily hair that is no more dense than our own. It simply appears to be fur because it is longer.) When Kanzi headed off the trail into the swamp, we sometimes went along in the beginning, swatting at the mosquitos, tripping over fallen logs, and sinking into the mud. We were inevitably frustrated as we could climb only the sturdiest of small trees, and even then we were unable to swing about with Kanzi's cavalier grace. We cursed the thorns on the underbrush while we crawled along on our knees, vowing never to let Kanzi lead us this way again.

Kanzi seemed quite puzzled by all our difficulties, our slow pace, and what he must have viewed as an irrational fear of trees. He always wanted people to climb trees with him and indicated this by taking their hands and placing them directly on the tree while looking up at it and then back at the person. If that did not work, Kanzi would climb a short distance up the tree, then turn and gesture "come." Some of us would attempt to climb a tree on occasion, while others absolutely refused. If one dared to do so, it was important to be careful, for as soon as you were in the tree, Kanzi would approach and want to play by dangling from your feet or arms. He seemed to think that we could easily support his weight and that he needn't worry about falling—we would catch him. However, catching thirty to thirty-five pounds as it hangs beside one in a tree is a difficult job, and it was easy to be caught off-balance by Kanzi. Thus, my first rule whenever Kanzi and I were in the same tree was to hold on as tightly as I possibly could at all times. I never knew when Kanzi might decide to use my leg or my arm as a vine and suddenly hang on it with all of his weight.

After I gave Kanzi the bananas and the juice from the cooler, he climbed on top of the Treehouse, where he reclined to eat slowly and savor each bite while surveying the forest. As at all the other locations, he had come not only to expect the food that had been placed there but to feel especially like eating that food at that location. That is, Kanzi behaved as though bananas and juice tasted *particularly* good when he was at the Treehouse, peaches and strawberries were just delicious when he was at Lookout Point, the raisins at Midway were exceptional, and so on.

Many times, as we went into the woods, I carried a little food in the backpack to make certain that Kanzi had enough to eat in case the coolers had not been filled properly or had, as sometimes happened, been visited by one of the industrious raccoons that inhabited the forest. (The raccoons were so adept at getting coolers open no matter how we secured them that occasionally I wondered if we shouldn't be studying their problem-solving skills as well as Kanzi's.) Whenever I carried food along, it always seemed that Kanzi never felt like eating bananas till we happened near the Treehouse, or never felt like eating strawberries till we approached Lookout Point. Suddenly, once we were at Lookout Point, a great craving for strawberries would set in. Perhaps apes in the field utilize this location-

triggered "craving" to help them recall where to find certain fruiting trees in the vicinity.

It would be wrong, however, to convey the impression that Kanzi always had to eat M&Ms at Flatrock or peaches at Lookout Point. Many times, he was not even hungry and would simply go to a location and play without showing any interest in the food at all. If I opened the cooler and offered him some food, he would turn it down. But when he was hungry, he seemed to have a certain fondness for the foods that were associated with that location. Having learned these food-location associations with amazing alacrity, he also possessed a rather uncanny memory for any new foods that he happened to have at other places. For example, one day, late in the fall, I let him visit my house, which was only about two hundred yards from the laboratory. While he was there, he found some very tasty jelly in the refrigerator. He did not return to my house again until the following year, as it grew too cold to travel outdoors. However, when he returned, he at once used the keyboard to ask for some "jelly" and pointed to my refrigerator, though I had forgotten that he had eaten jelly there before.

I had originally begun the practice of carrying photos as a way to remind Kanzi of our destinations when we first began to introduce him to the woods. Since Kanzi initially did not understand the names of the locations, when I announced my intent to travel to Flatrock, for example, I would also show him a picture of M&Ms and of Flatrock, hoping that if the words and symbols were meaningless to him, at least the pictures might help him understand that I was attempting to convey a plan of future action. Then as we traveled I would occasionally draw his attention to the photo to try to remind him of our destination as we came across other locations in the forest, hoping that he would begin to understand that my intent to travel to a faraway location such as Flatrock, even though expressed thirty to forty-five minutes earlier, nonetheless remained intact.

Kanzi quickly caught on to this use of the photographs and would ask to look at them frequently as we traveled toward our predetermined goal. Soon it began to seem superfluous to carry the pictures and constantly remind Kanzi of what it was that we intended to do, and we often forgot to take the pictures out of the bag. Kanzi knew all the locations and how to get to them and had begun to initiate most of the travel decisions himself. He also occasionally decided to make up for our forgetfulness with regard to the photographs, by finding them in the bag and carrying them himself. At times, he would stop along the way, point to a photograph, and look at us, apparently asking, "Do you know that this is where I am headed?" We would always agree, reaffirming for him that the location or food in the photograph was our goal also.

Later, we attempted a similar study with a nine-month-old child. We introduced her to the keyboard and to the use of photographs and let her choose a desired location of travel, even though she was not old enough to talk. Like Kanzi, she quickly realized that she could express her desires by selecting photographs; also like Kanzi, she often wanted to carry the picture with her and point to it as she traveled toward her goal. Neither could speak, and both were just learning to communicate with others about events that were going to happen sometime in the future. The pictures permitted them to gain some reaffirmation that indeed the intended actions of the group were still in accord with what had been agreed to at an earlier time.

Along the trail to Flatrock and M&Ms, we passed CrissCross Corners, but Kanzi did not seem to notice. As we approached the division in the trail just beyond CrissCross Corners, Kanzi reminded me to turn to the right by gesturing and leaning in this direction. Shortly after the trail turned to the right, we came to the footbridge that traverses the swampy area between the inner loop of food sites and the outer loop, both of which are on higher ground than the low area in the middle. Kanzi hopped off my shoulders and began to skip along the footbridge. Even when he wanted to be carried in other parts of the forest, he seemed to always enjoy walking on the footbridge. The swamp area was large; the footbridge ran for nearly two hundred yards and was often very slippery if it had rained recently. I was always very grateful when Kanzi decided to walk as we came to the bridge, because it was very narrow and tricky to negotiate even without an extra forty-five to fifty pounds of wiggling weight on my shoulders.

Along either side of the bridge lay the densest ground cover of the forest; a variety of stiff privet bushes, which grew well in the low muddy area, made it virtually impossible to make your way through the forest off the trail except by crawling through the mud on your hands and knees, and in some places even on your stomach. So I stayed on the bridge. Kanzi, however, seemed made to traverse low, swampy, muddy areas. He was totally at ease in these bushes, as though he had encountered his natural element. Since no one really wanted to follow Kanzi on his short forays off the bridge and into the privet bushes, the bridge became Kanzi's favorite place to play hide. Sometimes he gave us the benefit of using the keyboard to announce that this was what he was going to do; other times, I would be following him as he tripped happily along the bridge in front of me only to round a corner behind and suddenly—*no Kanzi*. He seemed to delight in his ability to vanish without a trace when no one was looking. Moreover, he could move through the dense privet bushes without a sound once he elected to fade into them.

I had read the field reports about how bonobos in Zaire eluded researchers by simply fading into the brush without a sound. Fieldworkers sometimes reported that they felt literally surrounded by bonobos, as if being watched by the entire group, yet they could see not a one. As Kanzi vanished into the privet bushes, I knew distinctly how they felt. Of course, I always worried that something might happen to him while he was out of sight. What if he found an unusual mushroom and popped it into his mouth and it turned out to be poisonous later on? Did he know better than to do that? What if he came across a copperhead or water moccasin—would he see it in time, and if so, would he be inclined to avoid it? What if he just decided to walk so far away into the privet bushes that he eventually came to the river that ran alongside the forest. Would he jump in the river? Would he drown? Of course, he never did any of these things, and I had no real reason to believe that he would, yet it was difficult not to worry while he was out of sight. For his part, he thought the whole affair great fun, for he could always peek out and see me whenever he wanted as he knew I would be standing on the bridge. He never went very far, maybe fifty or seventy-five feet, but the bushes were so dense that it did not matter. Even though he was nearby, he could not be seen.

When Kanzi vanished from the bridge on the way to Flatrock, I did not show my concern for his safety but continued to act calm and do my best to play my role in the game—which was to search for him. Jeannine and I moved apart and began looking under the bushes close to the bridge, calling out "Kanzi, Kanzi, where are you," which was what he loved to hear. I crawled a little way into the privet bushes but of course could see nothing. Jeannine walked ahead on the trail and then back down the direction we had come from and announced that she had seen nothing. When we could not find Kanzi, I decided to engage in another strategy that had, on past occasions, successfully pulled Kanzi out of the privet bushes. I sat down and began to look through the contents of my backpack, commenting to Jeannine on things that I knew were of particular interest to Kanzi. I mentioned the pictures, the towel, the can opener, the bowl, the wipees—all with no response. Then I noticed some balloons, one of Kanzi's favorite toys, and said loudly, "Oh, Jeannine, look, I found a red balloon in the backpack." From out of the woods only a few feet away we heard the little "Eehhh" sound Kanzi makes when something catches his interest—but still no Kanzi. So I continued to look in my backpack, mentioning the soap bubbles and the hat; and then in the very bottom, I found a small candy surprise. I had hardly gotten the words out of my mouth when suddenly Kanzi was sitting on the bridge right in front of me, staring into the backpack. He found the surprise, then picked up the M&M picture, which he had dropped on the bridge when he disappeared into the bushes, and announced that he was ready to proceed by climbing back onto my shoulders and gesturing in the direction of Flatrock.

As we proceeded on down the bridge we came to Midway, where there were raisins hanging in a bag over our head. Thinking that Kanzi might want some raisins, even though he had not mentioned them, I held the keyboard up and asked, "raisin?"—trying to determine if he wanted to stop to get the raisins. Kanzi, who had not yet learned the "no" symbol, responded by placing his hand on my head and turning it sharply in the direction of Flatrock. Once he had me looking in the proper direction, he gestured "go" to let me know that he was not interested in stopping for raisins, but only in proceeding on to M&Ms. Shortly past Midway the footbridge ended, and we were back on higher ground and out of the privet bushes. Kanzi climbed down from my shoulders and tugged on the keyboard to indicate that he wanted to say something. I placed the keyboard on the ground, and he commented "kiwi ball."

Balls are Kanzi's favorite toy, and he often carried one with him during our walks in the woods. Equally often, he left them somewhere in the woods, apparently on purpose. He would seem to tire of dragging the ball along constantly, so he would stop, look around, and then place the ball near some bush or tree. When he first began to leave his ball in the woods, we did not think much about it. Yet we soon noticed that he seemed to be able to recall where he had left it days or even weeks later.

When Kanzi said "kiwi ball," I wondered if he had just remembered that he had left a ball near Log Cabin, where we usually find kiwis in the cooler, or whether he was simply trying to tell me that he wanted both a ball and some kiwi. I did not recall him leaving a ball there, but he often went in the forest with Kelly and Rose when I was not with him. When we arrived at Log Cabin, I saw no ball. Kanzi dropped his M&M photo and pointed to the cooler to indicate that he was ready to have some kiwi. While he was eating, I made notes on the things we had done so far that day. When I looked up, Kanzi was gone again. I asked Jeannine where he had gone, and she said that he had just gone behind Log Cabin. A moment later he popped out with his ball in hand. Not only had he left his ball at Log Cabin, just as he said, but he had hidden it in the bushes; only he knew where it had been left.

After playing with the ball, Kanzi then showed me the M&M picture, tapped the M&M symbol on the keyboard, and headed off toward Flatrock with his ball. At Flatrock, he inhaled the M&Ms, as was his habit. I tried to dissuade Kanzi from eating too much candy, so M&Ms was one of the furthest locations from the lab, and I limited the number of M&Ms that were placed there. Kanzi loved M&Ms and tended to eat them as fast as he possibly could. The only way I could slow him down was to scatter them on the ground after I retrieved them from the cooler, so that he had to look through the leaves of the forest floor and find each one before he ate it. He was aware of my trick, however, and today he came up behind me and grabbed the bag out of my hand before I had a chance to scatter even a few M&Ms on the ground. All the M&Ms went into his mouth at one time.

After Kanzi ate the M&Ms, he began to look tired. It was getting to be midday, the time at which both Kanzi and bonobos in the wild usually take a nap. Kanzi settled down in my lap, looked over toward the keyboard, and commented "bedroom." It was a long way back to the bedroom, at least a forty-minute walk, and Kanzi looked too sleepy to make the trip, so I suggested that he take his nap at Flatrock. Kelly and Rose would soon come to relieve Jeannine and me. Jeannine had been with Kanzi since seven o'clock that morning, and it was now two o'clock. It was difficult for any of us to keep up with Kanzi for more than seven or eight hours without a break. If they did not find us napping in the bedroom, I knew they would come and look for us in the forest. As Kanzi dropped off to sleep, I continued making notes about what he had done that day.

Suddenly, the wind picked up and we began to hear rumblings in the distance. I looked up to see storm clouds moving rapidly above the trees and realized that we were about to be caught in a summer thunderstorm. I woke Kanzi up and told him "rain come" and that we had to "chase [to] Hilltop." Hilltop was the closest place where we could find shelter from the rain. It was only a small plastic tarp thrown around some poles in tepee fashion, but it was certainly better than nothing at all.

We grabbed our backpacks and rushed up the hill as fast as we could. Kanzi clung tightly to Jeannine's stomach, gripping her shirt with his hands and feet, just as he would have held onto Matata. It was already sprinkling, and we had carried no umbrellas with us. We reached the tepee just before the sky decided to literally pour water, and all three of us scrunched inside together—only to find that we were not alone. A family of wasps had decided to make their home in the very top of the tepee, and they did not appreciate our intrusion. I realized they were there only when I heard Jeannine scream as she was stung. Shortly thereafter, Kanzi let out an equally loud yell as an angry one landed on him. In a matter of seconds, all three of us were outside the tent, drenched by the rain, with Kanzi still clinging tightly to Jeannine.

Luckily, I had not been stung. I grabbed the first large stick I could find, carefully reentered the tepee, and knocked down the nest. It fell on the wooden floor, and I backed quickly out of the tepee. Luckily, the wasps did not follow and attack me. Instead, they became somewhat disoriented as they flew out into the rain. In a few seconds I knocked the nest completely out of the tepee, and we sought shelter again, this time thoroughly drenched. We all sat there miserably wet and waited for it to stop raining. Kanzi scrunched up his eyes and tried to resume his nap, but somehow it just wasn't the same. The rain lasted another thirty minutes, then the sun came out again. Rose and Kelly appeared shortly thereafter, carrying umbrellas and dry towels and fresh backpacks. All of us were glad to see them. Jeannine and I left Kanzi in their care and headed back to the lab.

Evening Tours

During his evening trips, Kanzi was always very quiet and subdued. One night Kelly and I tried to camp out with him, thinking that he might enjoy such an experience. The later it became, the more concern he evidenced. He repeatedly told us that he wanted to go back to the group room, and when we refused, he pouted and fussed. When we tried to convince him to crawl under the covers and sleep, he resisted and simply sat in the door of the tent and gestured toward the laboratory. I ended up walking back through the woods in the dark at two o'clock in the morning with a very scared Kanzi holding onto me as tightly as possible.

Ever since Matata had left, someone had stayed each night with Kanzi. He had become accustomed to sleeping in a bed and watching television before he dozed off. Moreover, with his keyboard, he could order late-night snacks of all his favorite foods while watching television. He had become accustomed to a material world that was far richer and more entertaining than the world his mother could provide, and like many people who travel from primitive rural villages to the highly industrialized cities of the world, he elected not to trade the amenities of modern life for the simpler existence of yesteryear.

Kelly was in the bedroom, getting things ready for Kanzi. As I left him with her, I noticed that he told Kelly he wanted to watch "Austin [on] TV." He also asked for his "ball" and some "cereal." Shortly after Matata left, he had become attached to his ball in much the same way that some children become attached to a special blanket. He always wanted to make sure his ball was in bed with him at night and often sat in the middle of the bed with the ball on his lap watching television until he went to sleep.

Kelly put on a tape of "Austin" for Kanzi to watch and went out to find his ball and prepare his cereal for him. As Kanzi waited for Kelly to return, he began to arrange and rearrange the blankets in a big circular nest around himself. Once his nest was finished, he began to pay more attention to the television. He liked to watch many things on TV, among them *Tarzan*, *The Iceman*, *Quest for Fire*, and *My Pet Monster*. He also liked to watch tapes of Sherman and Austin, as he knew them from firsthand visits. Although they were now adult males, he often enjoyed seeing tapes made when they were much younger, closer to his own age. On these tapes, he could see them using their keyboard to talk with me, as well as games of chase, grab, and tickle being played with me and other people that he knew.

We had made many hundreds of hours of such tapes for documentary purposes while Sherman and Austin were growing up: consequently, Kanzi had a great variety of such tapes for entertainment. Kanzi began to ask for these tapes by saying "Austin TV" and sometimes commented on things he saw while watching them such as, for example, the 'scary monster' that suddenly appeared.

He would ask for other favorite tapes by saying "Fire TV" when he wanted to watch the movie *Quest for Fire*, "Ice TV" when he wanted to watch the movie *Iceman*, "childside TV" to see tape of things that were happening on the childside, and "gorilla TV" or "bunny TV" to ask to watch a tape we had made for him of the "gorilla" and the "bunny" who visited our lab from time to time, Kanzi's version of something like Sesame Street characters. From time to time one of the persons at the lab donned the gorilla or the bunny costume and made an appearance doing something that caught Kanzi's attention, such as playing with one of his balls or hiding in the forest. We often taped these appearances, and Kanzi loved these tapes best of all.

Kanzi combined other words on his keyboard to indicate a desire to see specific things, but there were no names on his keyboard for many of the videotapes he liked to watch. To help him, photographs of the contents of these videotapes were pasted on the tape cartridges themselves, so that he could select the one he wanted.

Kanzi had quickly become a sophisticated television viewer. When he watched tapes of events that had taken place in the forest or near the lab, he could reliably discern where he had seen someone hide a ball or surprise and then travel to that place to recover the coveted item. If he saw a gorilla on television near the lab one evening, the next day he would approach the precise location where the television had depicted the gorilla. With hair puffed out, he would cautiously approach, while sniffing various items that he had seen the gorilla touch while watching the videotape.

Once Kanzi has seen a tape, he is able to anticipate when especially exciting segments are about to appear if he views the same tape again. For example, in one tape, a gorilla (that is, a person dressed in a gorilla suit) hides in a van, and Rose gets in, ostensibly without seeing the gorilla, who continues to hide behind the seat as she drives off. Upon Kanzi's second viewing, as the tape approached the segment in which the gorilla was about to jump out and scare Rose, Kanzi produced loud "Waaa" calls even *before* this happened, revealing that he recalled what was about to occur from the previous occasion on which he saw the videotape.

After Kelly came back with his cereal, he snuggled up next to her and commented "Coke," as he saw Sherman and Austin drinking some Coke on the TV. A bit later, he also commented "M&Ms" when he saw me give Sherman and Austin some M&Ms on the TV. Kanzi then grew tired and lay down in his nest and began to gently tickle with Kelly. Kanzi is generally extremely happy in the evening, and this evening was no exception. He demonstrated his good humor by chortling away with a wide range of sounds, much as a young child might babble to itself before falling off to sleep, but somewhat louder. I dropped in to tell Kanzi

good night, and he responded with a whole medley of vocalizations. The next day, Kelly described his evening soundfest in our daily record of Kanzi's activities:

> Kanzi got into what I refer to as his "conversational mode," in which he vocalizes continuously in much the same way a small child will babble. He "talks" in this manner when other people are talking, especially if they are talking to each other rather than to him. It is as if he feels the need to be part of the conversation. He makes a lot of these vocalizations at night when he is ready for bed. Something about the night turns him into a motor mouth and I frequently get headaches when I put him to bed from his incessant chattering! As he drinks his nightly glass of water, stretched out on his back, he also feels an obligation to continue his conversation. With a large mouthful of water he looks just like a little fountain, bubbling over, as he tries to talk and drink at the same time. Even as he slows down and can barely even move due to fatigue, he still deems it necessary to answer each of my questions with some sort of verbal comment. When he is that tired it seems to take all his strength to utter any sound as he scrunches up the little muscles in his face and tries to talk. It is obvious that it is quite an effort for him and often he will open his mouth to speak, yet three or four seconds may elapse until he is finally able to get a sound to come out.

Living with Kanzi

Kanzi's days continued to be filled with treks in the woods, campfires, visits to Sherman and Austin, time with Matata, and special videotapes made just for him and, later, his two younger sisters, Panbanisha and Tamuli. As he grew older, the number of words he could understand steadily increased. We added symbols to his keyboard until it began to seem unwieldy at 256. Although Kanzi understood many more than 256 words, it was difficult to find just the word one wanted when one had to search a display of 256 words. Fortunately, however, Kanzi is not limited to lexigrams—he employs vocalizations and gestures as well. In fact, he typically combines several of these modes to make a more complex request, thus expanding what he can say beyond the limits of the keyboard itself.

For example, one of Kanzi's favorite games in the summertime is to have someone fill his or her mouth with water and chase him while trying to drench him with the water. Kanzi also likes to fill a balloon with water and play keep-away until the balloon bursts. When he wanted to play such games with the water hose, and there was no symbol for "hose" on his keyboard, he conveyed his intent by saying "water chase," then pointing to the hose. He would indicate that he wanted to play the water chase game by saying "water balloon" and then gesturing toward the hose. To be certain of Kanzi's intent, I would generally rephrase it aloud in English for him. If I had correctly discerned what Kanzi wanted me to do, he would respond with loud, happy vocalizations. For example, if he wanted me to fill the balloon full of water so that we could play keep-away, I could say, "Oh, I think you want me to make a water balloon and play chase?" If this were the case, Kanzi would respond with happy vocalizations that sounded as though he were attempting to say "un-huh." If not, he would studiously ignore me.

Kanzi also produces a vocalization that sounds a lot like the whining noise young children make when they want something quite badly that they do not have. Kanzi uses this sound in many different circumstances, but they all seem to have in common his desire to have something that someone is withholding. For example, one day, after several bouts of chasing with the hose, the balloon, and a number of other objects, I noticed that Kanzi was tapping my foot and vocalizing "Annngh" as though he wanted something. I looked down to find that I was standing on his collapsed water balloon—he was trying to show me that I needed to lift up my foot so that he could retrieve his balloon.

Kanzi has invented a number of gestures that are more specific than the pointing or indicative gestures he frequently uses when there is no symbol on his keyboard for a certain object. For example, to ask that someone open something for him, such as a bottle, he makes a twisting motion with his hand (as if twisting off a lid), sometimes on the bottle, or just above the bottle. Another gesture he has developed is a rapid handshaking motion, typically directed toward a particular object. The contexts in which Kanzi uses this gesture have led us to interpret it as meaning "do something" or "act upon something." For example, one morning Kanzi discovered some sweet potatoes cooking on the stove. Seeing the steam rise, he began making his "do something" gesture while pushing my hand toward the boiling pot. I did various things to the potatoes—stuck them with a knife, spun them around, and so on—which Kanzi enjoyed watching. Each time I stopped, Kanzi would gesture, by shaking his arms, for me to continue performing some type of action on the potatoes. Another example occurred when he discovered a turtle outside. He was not sure he was brave enough to approach the turtle by himself, yet felt it had to be dealt with in some way. So he pushed my hand toward it, then made his "do something" gesture. He has similarly used this gesture when encountering other animals or strange objects, in an attempt to elicit some action toward those objects by others.

Kanzi manifests great pleasure in participating in social games; however, unlike many other animals who play similar games with human beings, Kanzi thoroughly enjoys watching people play with each other. Just as we go to sporting events and watch people catch, throw, chase, and battle over balls, Kanzi delights in watching people at the laboratory play physical games. He can be relied on at any social gathering to initiate games between people by saying "chase," then taking someone's hand, for example mine, and pushing it toward another person, such as Kelly. I interpret this as a request for me to chase Kelly and, if Kelly agrees, I will chase her until I tag her. As soon as Kelly is tagged, Kanzi will ask us to invert our roles by pushing Kelly's hand toward me, and again saying "chase." Kanzi initiates not only chase games between other people, but also games of tickle, grab, hide, and keep-away.

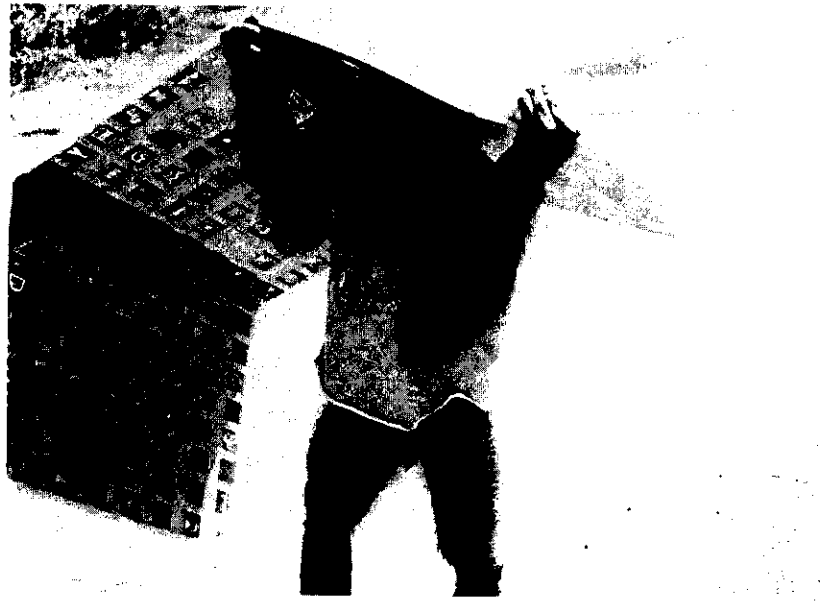
When three or four people are with Kanzi, he usually tries all combinations. For example, Rose will be asked to chase Kelly, as will Liz; Liz will be asked to chase me; I will be asked to chase her; and so forth. Kanzi even requests three-way chase games, by pushing both my hand and Liz's toward Kelly, for example. Often during such games, Kanzi will lounge in a tree or on the ground and watch

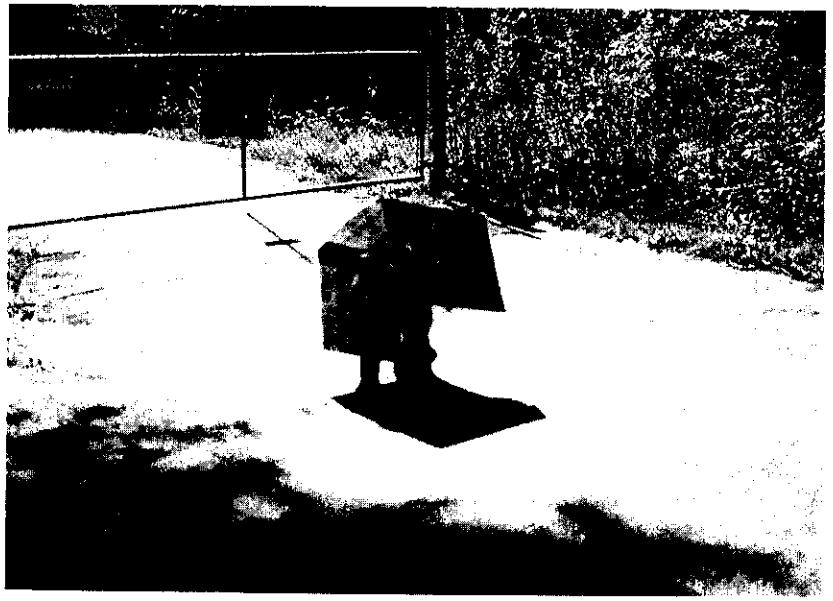
take his orange to the childside, he again followed English word order; but had he used the inversion of this order, his meaning would nonetheless have been clear, because he was holding an orange at the time, and oranges are not generally found on the childside. It is important to note that when words of different classes are used, syntactic rules are almost never required for clear communications as long as the sentences are only three or four words long.

In addition to employing simple syntactic devices, Kanzi also takes an interest in saying the same thing in several different ways and noting the relationships between symbols, photographs, and objects. For example, when someone makes a vocal comment about, say, a ball Kanzi is playing with, he will often touch the ball lexigram on the keyboard, point to a photograph of a ball if any are around, and then gesture toward his real ball, as though denoting that all of these items are equivalent in some manner. Sometimes, he will even take a toy or a food and place it directly on top of the lexigram that stands for that object. When several keyboards are available, Kanzi frequently uses all of them, sometimes repeating his statements on multiple keyboards, other times using different keyboards for different utterances.

Kanzi also talks to himself, particularly at nap time or other quiet periods of the day. He does this by picking up the keyboard, moving a short distance away from the rest of the group and turning his back. He then scans the board and touches particular lexigrams. If I try to look over his shoulder to see what he is saying, he

Kanzi wants to be alone. He first picks up the keyboard and wraps it around himself.





He then decides that this is not sufficient, so he stands up with the keyboard still wrapped about himself and carries it about thirty yards away.

He then sits down and begins talking to himself. On such occasions, he did not seem to want us to know what he was saying. If we approached, he either turned his back or moved away. Here he is pointing to the symbol for his favorite object, "ball."

generally picks up the keyboard and moves further away. At times, he touches symbols, then glances over his shoulder to look at me, as though he wants me to see that he is talking, but does not want me to see what he is saying. Occasionally, I can catch glimpses of his comments, but if I try to talk about it with him, or make a comment on what he is saying, he seems to find this disturbing, and he will either quit talking to himself or move completely out of sight. When I do catch a glimpse of his monologues, I frequently see him pointing to the lexigrams "good" and "bad." He also talks about his "ball," his favorite foods, places he likes to go, and about tickling, chasing, grabbing, and biting.

When the lexigrams "good" and "bad" were first placed on Kanzi's keyboard, I did not think he would use them frequently, or with intent. I put them on so that everyone would have a clear way of indicating to Kanzi when we felt that he was being good or bad. To my surprise, Kanzi was intrigued with these lexigrams and soon began using them to indicate his intent to be good or bad, as well as to comment on his previous actions as "good" or "bad." When he was about to do things that he knew we did not want him to do, he started saying "bad, bad, bad" before he did them, as though threatening to do something he was not supposed to do. He would, for example, announce his intent to be bad before biting a hole in his ball, tearing up the telephone, or taking an object away from someone.

One day, when Kanzi was supposed to be taking a nap with Liz, who was exhausted and went to sleep, Kanzi refused to lie down. After she had been asleep

about fifteen minutes, she suddenly realized that the blanket she was using as a pillow had been rudely jerked out from under her head. She sat up to look over at Kanzi who commented on his action, saying "bad surprise." Another time, when he was supposed to take a nap, he did not want to do so. He asked to play "chase water" instead, and when told that he could not do so, he commented "bad water" and proceeded to take the hot water hose and spray it all over things.

Kanzi knew that taking blankets away from someone, particularly if they were sleeping or sitting on them, was not acceptable. Indeed, this was one of the few behaviors that even Matata would not tolerate. One day, when Kanzi was nearly six years old, I noticed that he had a very fresh injury on his hand and he appeared to be unusually subdued, almost depressed. When I asked Kanzi how he had gotten hurt, he responded, "Matata bite" and then gestured to his hand with a plaintive expression. I later learned that this was indeed the case. His assertive, rambunctious attitude had become too much for Matata, who was preoccupied with Kanzi's new sister, Mulika, and did not want to play with Kanzi. He tried to gain his mother's attention by stealing some blankets from her nest, an act she did not appreciate. When he refused to give the blankets back, Matata bit his hand hard enough to actually break the skin. Kanzi appeared to be shocked and subdued. Never before had Matata done such a thing, no matter how rude he was toward her. Even bonobo mothers have limits to their patience.

Kanzi not only shows concern over his own injuries, but also over the injuries of others. For example, on one occasion, while attempting to open a can of cherries by throwing it, he accidentally smashed the can into Kelly's knee. She screamed in pain and grabbed her knee with her hand. Kanzi did not realize that the can had landed on Kelly, so when she held her hand tightly on her knee, Kanzi assumed that it was her hand which had been hurt. He approached and looked at Kelly's hand intently, but saw only a small scab from an old cut. Seeing nothing else wrong with her, Kanzi assumed that this must have been the cause of her distress. Wanting to help her feel better in some way, he gently pushed Kelly's hand toward a canteen of water which Rose was holding. Rose asked Kanzi what he wanted, and he replied by pointing to the canteen and then to Kelly's cut, to indicate that Rose should pour some water on Kelly's wound. When Rose complied, Kanzi gently tried to clean the cut. Of course, it was not Kelly's hand that had caused her to scream, but she was so intrigued by the thoughtfulness Kanzi was showing for her that she completely forgot about the pain in her knee.

The ability to empathize with another party suggests that Kanzi can understand that different people experience the world in different ways. He recognizes that he himself can feel quite well while another person is in pain, and that he can be in pain while another person feels fine. Kanzi not only recognized that Kelly was in pain but wanted to do something to help.

When Kanzi is in pain, he will point to the location that hurts and show it to me. He will even show a sore limb or sore throat to the veterinarian. He seems to understand in some limited sense that we are attempting to help him, and he has been willing to cooperate with having his temperature taken and even receiving frequent injections when necessary. Though many apes are hesitant to take medication, Kanzi is always extremely cooperative in this regard, even though he may

not like the taste of the medicine he is receiving. His cooperative attitude with regard to unpleasant medication and injections suggests some understanding that these activities reflect our attempts to help him feel better.

Matata, in contrast, refuses all injections and is highly suspicious of any food that contains even the slightest trace or lingering odor of a drug. Indeed, she is so sensitive to the possibility that drugs may be placed in her food that she occasionally refuses to accept food that is prepared in a manner that differs in any way from what she is accustomed to.

Kanzi suffered through a number of illnesses and injuries as he grew up, but the most serious was an infection of the air sac tissue below his chin. Unlike humans, apes have pouches under their throat that can be filled with air and that may help resonate the sound produced by their vocal cords. When this tissue becomes infected, it must be repeatedly drained, and high doses of antibiotics must be injected every four hours. Although Kanzi was quite willing to accept the frequent injections his illness required, the veterinary staff did not believe that he would continue to do so on a daily basis for several weeks. Thus, it was determined that he should be taken to another facility and placed in a small squeeze cage that barely gave him room to sit and certainly no room to stand. The front of this cage was attached to rollers and, by a system of levers, could be cranked forward until it nearly reached the back wall of the small enclosure, trapping the animal within a vise. Such cages are used routinely with apes that refuse to accept injections. They confine the ape so rigidly that it cannot get away from the needle or knock it out of the veterinarian's hand.

Kanzi had never experienced any sort of confinement, so he was terrified when he awoke from sedation and found himself in a completely strange place in this small cage. He heard around him the screams of strange chimpanzees, whom he could not see, and he was as frightened by their cries as by his own predicament. Had he been able to get out of the small cage, he certainly would not have left the tiny room that held it, because of the awful noises outside the door. Everyone at the Language Research Center was concerned about the traumatic effect of this experience on Kanzi, and we took turns staying with him day and night so that he was never alone. He continued to permit us to give him injections through the bars of his small cage, and it was never necessary to squeeze the walls together to force him to accept them.

We attempted to reduce the fear generated by the screams around him by letting Kanzi watch us take a video camera out of the door. Since we regularly made tapes at the lab, Kanzi understood that a video camera could show him pictures of areas he could not see for himself. We taped the chimps in their long rows of cages outside Kanzi's isolation room. I hoped that he would be able to see that the chimps outside his room were all right, even if they were unhappy. However, the tape was so frightening to Kanzi that he would not even watch it. He turned his head away and asked for tapes of the bunny, Matata, and other things from the Language Center that were comforting and familiar to him.

In spite of his extreme confinement, Kanzi did not become depressed, but generally maintained a good humor, though he was certainly bored. I could never have

endured the long confinement in that room as well as Kanzi. I stayed with him in eight-hour stretches before someone would come to relieve me, and even these periods were almost unbearable. Strangers in white lab coats regularly walked by, day and night, and stared at us through the small window in the door. Water leaked onto the floor from pipes in the ceiling. The light was either a harsh yellow glare from the single fluorescent fixture in the ceiling or total darkness. Kanzi endured all of this, in addition to frequent injections and periodic sedations, with a stoic fortitude that would become most people.

His air sac infection finally abated, and he was permitted to return to the Language Center. This was perhaps his day of purest joy. He was extremely grateful to be back and showered everyone, apes and humans alike, with affection. Once back at the Language Center, Kanzi became fascinated with the tapes of the other apes around him that we had made while he was in confinement. He wanted to watch these over and over now that he was no longer there but was safe instead. It was as though he could now deal with the fears that these noises had caused him before, since he knew that they were no longer coming from directly outside his door.

Theory of Mind

The cognitive ability to grasp that someone else may see and think about the world differently from you is characterized by scientists in terms of the possession of a "theory of mind." Many cognitive scientists believe that, unlike us humans, apes and other animals are incapable of recognizing that their perspective of the world may differ from that of those around them. Hence, they are said not to recognize that other individuals "think" and so are incapable of attributing intent or premeditation to the acts of others or of holding them at fault for any undesirable actions. Dogs, for example, might not like a master who treats them unkindly, but they are not said to "blame" him for this, only to avoid him. Presumably, they do not recognize that the master is deciding to do this, only that it happens. However, because we humans supposedly do possess a theory of mind, when someone mistreats one of us, we apparently form beliefs about the miscreant's state of mind—determining, for instance, that his action was intentional and calculated to cause us harm.

The use of language for the purpose of communication can be thought of as resting on the assumption that the point of language is to tell others things we assume they do not know. Scientists who study the behavior of animals disagree about whether or not animals are doing the same sort of thing when they make noise. Dogs may bark, for example, because they are excited. Other dogs, hearing excited barks, may also become excited and bark themselves. The dog who barked first may have only been expressing his own mood, much as we do when we laugh or cry spontaneously. Can he have intended to tell some other dog that he was excited? Since we cannot ask other animals—or, for that matter, very young children—if they make sounds with a particular purpose in mind, scientists typi-

cally disagree about the justification of attributing purposive behavior or communicational intentions to them. What is clear is that we have not yet developed a reliable method for addressing such questions.

Nevertheless, there can be no doubt that Kanzi attributes intentions and feelings to others and that he recognizes the need to communicate things about his own mental state to others. From his early gestural communications, like asking me to make his own mother permit him to nurse, to his present ability to tell me where his ball is hidden or that he has a sore throat, Kanzi's communications are inevitably characterized by a desire on his part to get an intentional message across. If one method does not work, he recognizes this failure and attempts to alter what is said in order to clarify his intent.

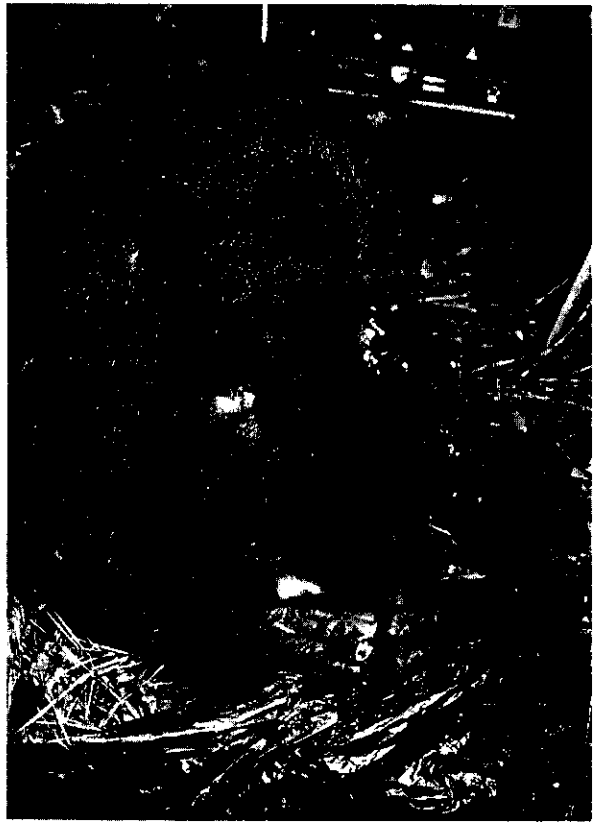
Neither I nor others taught Kanzi how to engage in purposeful communication—it was an ability he developed on his own. Moreover, this ability first began to emerge when he was about nine to eleven months old. For example, when Kanzi was seven months old, I knew he wanted to play because he would approach me with a happy face and begin playing. As I sat in Matata's large nest grooming her, Kanzi enjoyed having me tickle his neck, pull on his toes, and slap him gently on his lower back. He liked to bat my face with his hands, kick my head with his feet, and tug on my hair. We would play in this way for twenty to thirty minutes at a time.

Kanzi's sister Mulika demonstrates how she feels about "man's best friend." When he was young, Kanzi often tried to use the keyboard to ask the dogs to play chase and tickle with him. However, as he grew older, he seemed to realize that they did not understand lexigrams and this behavior ceased, though he continued to vocalize and gesture to the dogs to make his wishes known.

The experimenter has just shown Kanzi some food in the cooler and Kanzi is about to touch "fire lighter" to indicate that he wants to make a fire and cook the food.

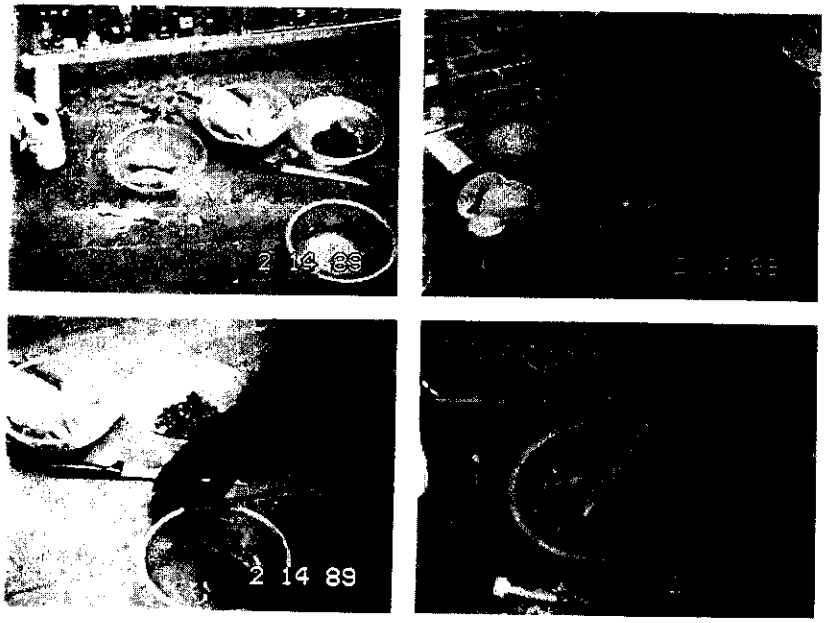
Then, at around nine months, he began to give me signals of his intent to play. For example, instead of just climbing about me and dangling his feet on my head, he would climb above me, hold one foot out in my direction, and wiggle it suggestively while monitoring my face and eyes. If I pretended not to see, he would position himself squarely in front of my eyes and again shake his foot to invite me to play. He not only gesturally signaled his intent to play, but also his intent to be carried, his intent that I assist him in retrieving objects out of his reach, his intent to give me a hug, his desire to leave Matata, and indeed, anything that he wanted me to do for him. Later, he began to use the keyboard to signal similar things, but in a more specific way; his use of symbols occurred as a natural outgrowth and elaboration of these earlier gestural indications of intent.

In addition, with the keyboard, Kanzi can express intentions that are difficult to convey by gesture alone. For example, he can tell us where in the forest he plans to travel. Here it is easy to determine whether or not Kanzi means what he said—we need only look to see whether or not he goes to the place he named. Kanzi also often specifies the travel route. For example, if he is headed for Midway, where raisins are found, he may say "A-frame raisins" or "juice raisins" to indicate which trail he intends to take to Midway—the one that runs past the Treehouse (where he can find juice) or the one that runs past the A-frame. Kanzi similarly tells us whether he wants to play tickle, chase, bite, grab, slap, or hide, and if we agree to play, we have only to note the game he initiates to see that his expressed intentions coincide with his behavior.



Kanzi has gathered some sticks, some pine needles and a plastic bag in a pile and is lighting them with a cigarette lighter. When he was young, he held the lighter in one hand and flipped the switch with the other. As he became an adult, he began to use the lighter as we do, by holding it in one hand and flicking the switch with his thumb.

Skeptics suggest that somehow people are able to surreptitiously help Kanzi make his actions and words agree. They suggest that although Kanzi appears to use language to express his intentions, this may not be the case as long as people are present, because people are a source of subtle cues. If these critics could only experience how difficult it is to get Kanzi to play a game he does not want to play, or go to a location that is not to his liking, they would not be so concerned. It is not only impossible to covertly signal to Kanzi to do something he does not wish to do, it also seems that the larger he becomes, the more difficult it is to find any means whatsoever to get him to do anything other than what it is he has his mind set on.



(top, left) The items in front of Kanzi as he listened to the sentence "Can you knife the sweet potatoes?"

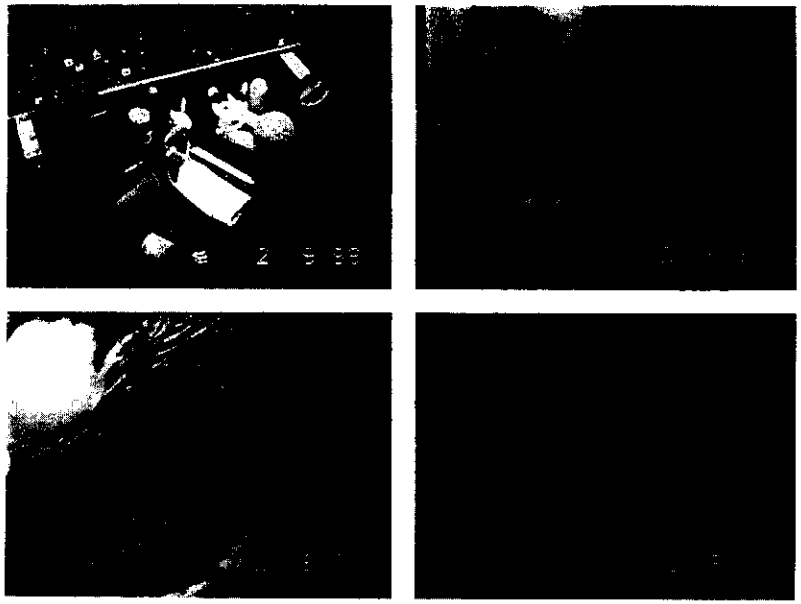
(top, right) Kanzi's expression as he hears the sentence.

(bottom, left) Kanzi picks up the knife between the bowls of water and raisins.

(bottom, right) Kanzi inserts the knife into the sweet potatoes.

Kanzi, like many children, also reveals an understanding of the difference between what is and what we may believe to be the case by engaging in games of pretend. His favorite pretend game centers around imaginary food. He pretends to eat food that is not really there, to feed others imaginary food, to hide such food, to find it, to take it from other individuals, to give it back to them, and to play chase and keep-away with an imaginary morsel. He will even put a piece of imaginary food on the floor and act as if he does not notice it until someone else begins to reach for it, then grab it before they can get it.

Just as with a real object, Kanzi will remember the location of the imaginary invisible object, and the fact that he has placed it in a specific location on the floor, for five to ten minutes or more. During that time, I will also pretend not to notice where he put the food, so I can catch him off guard and grab it when he is not looking. However, even if I engage him in a completely different activity, when I try to grab the imaginary object, Kanzi will attempt to stop me and get it for himself. Often such games will be started by noting a picture of food on some object. Kanzi then pretends to grab the food off the picture and eat it, while sharing some with me. He also will pretend to grab some food off the TV screen and give me a bite of it.



(top, left) The array in front of Kanzi as he listens to the sentence "Can you put the ball on the pine needles?"

(top, right) Kanzi's expression as he hears the sentence.

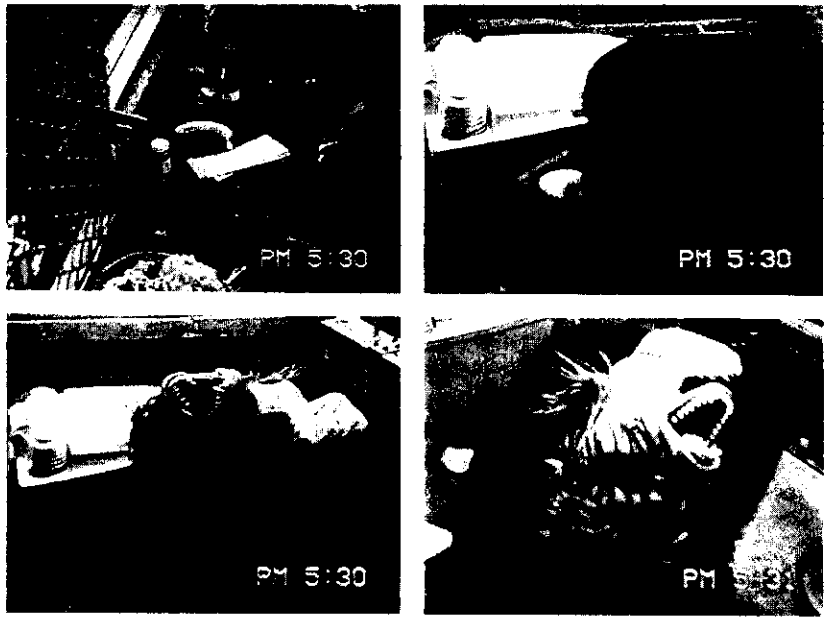
(bottom, left) Kanzi picks up the ball.

(bottom, right) Kanzi places the ball on the pine needles.

Interestingly, Georgia is known as the Peach State, and on car license plates, the state has recently placed a drawing of a peach. Kanzi often grabs a bite of such peaches as he passes by the license plates on cars. Such games are something like the bonobo version of a child's tea party. Kanzi similarly enjoys feeding a toy dog imaginary food and engages in imaginary games with toy dogs and chimpanzees, as children play with dolls. Kanzi's imaginary food games lack the more elaborate structure and utensils of a child's tea party, but they retain the key elements of playing with imaginary food and doing all the things with it that one might do with the real item.

Kanzi also engages in pretend games that have to do with danger. For example, he may pretend that a toy dog or toy gorilla is biting him or is chasing and biting a person. He also likes to put scary monster masks with large teeth over his head and then pretend to chase and bite someone. He may also ask me to pretend to be such a monster and to chase and bite him. Occasionally, as I chase him, he will even scream, as though he is pretending to be afraid of me. When I stop in response to such screams to see if he is really afraid, he seems puzzled as to why I have stopped the game and gives no evidence of real fear at all.

Like many other apes, Kanzi also pretends that toy chimpanzees are younger companions to carry about, tickle, hug, play bite, and share food with. However, he tires rather quickly of this companion who does not really play but must be carried about all the time. In contrast, his younger sister Tamuli will constantly carry such a doll with her and cry loudly if it is taken away. One day Kanzi killed a squirrel that had strayed too far into his playyard, and afterward he allowed Tamuli to have it. Tamuli carried the squirrel about as if it were a baby, making certain to position its head upright and to pull its little feet around her waist as though it were clinging to her. She groomed it carefully and pretended to nurse it, just as she saw Matata do with her younger sister Neema, who was only a few months old. Tamuli was extremely proud of her "baby" and showed it off to everyone. She knew, of course, that she had a squirrel, not a real bonobo infant; from time to time she would put it down while she got interested in something else, and then she would run back to play with it. While pretending that the squirrel was her baby, she would follow Matata around doing everything to the squirrel that she saw her mother do with her new younger sister Neema. It was necessary to



(top, left) The array in front of Kanzi as he hears the sentence "Can you go scare Matata with the mask?"

(top, right) Kanzi eating food as he listens to the sentence.

(bottom, left) Kanzi puts the mask on his head and sits still for a second.

(bottom, right) Kanzi heads toward the colony room where his mother is located.

Kanzi has gathered some sticks, some pine needles and a plastic bag in a pile and is lighting them with a cigarette lighter. When he was young, he held the lighter in one hand and flipped the switch with the other. As he became an adult, he began to use the lighter as we do, by holding it in one hand and flicking the switch with his thumb.

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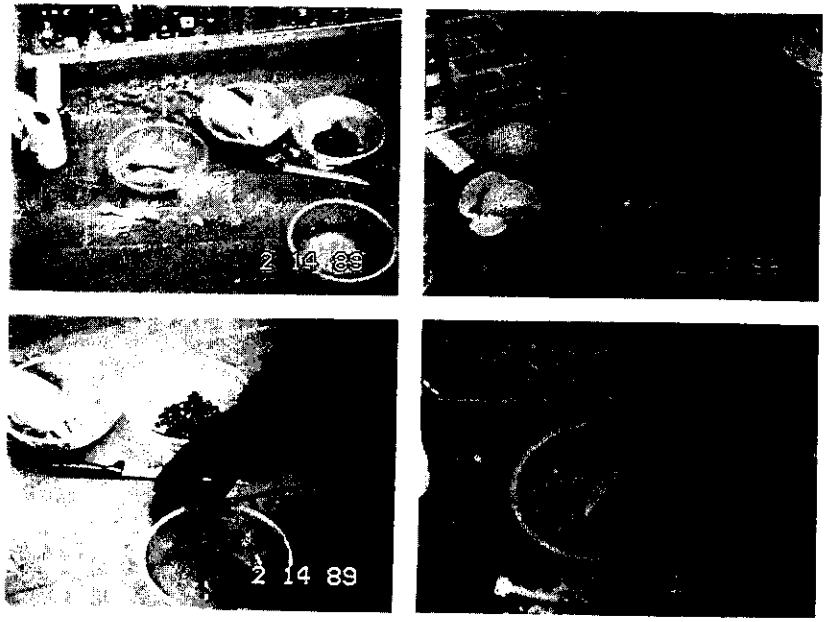

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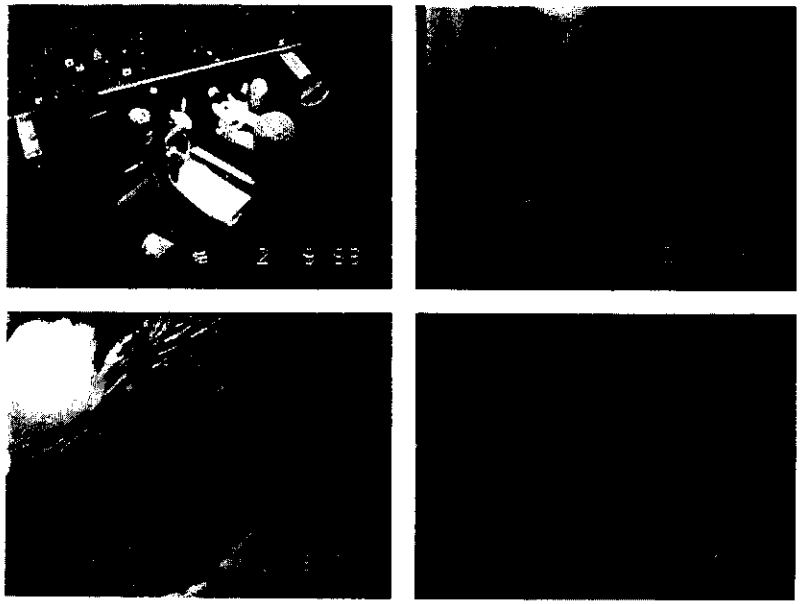

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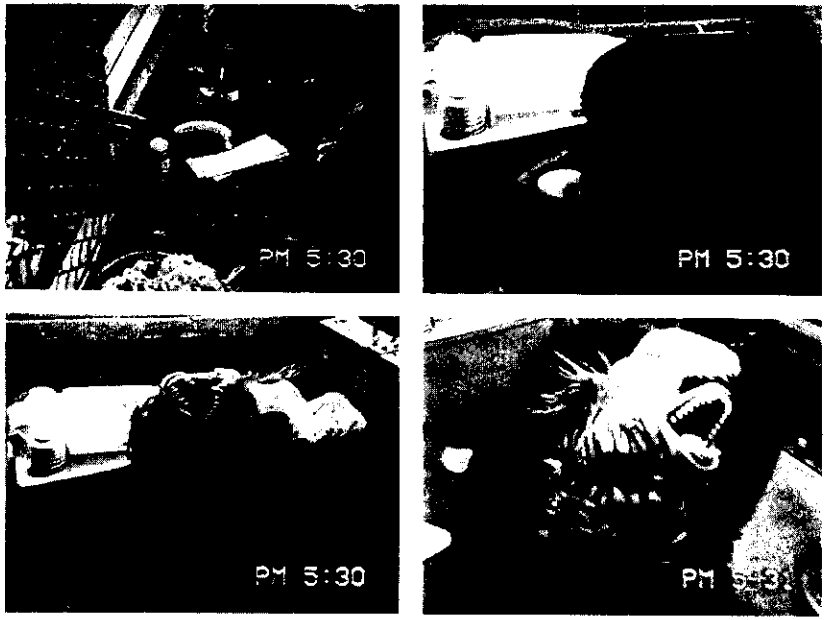

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(bottom, right) Kanzi heads toward the colony room where his mother is located.

(top, left) Kanzi takes off his mask and waits by the colony room door for someone to open it as he does not have a key.

(top, right; bottom, left and right) After the door is opened Kanzi puts his mask back on and parades up and down in front of Matata's cage.

take the squirrel away, because a dead animal posed a health risk to the bonobo group, and Tamuli was very sad when I made her give it up and behaved as though she were somewhat depressed the rest of that day.

As Kanzi grew older and the variety and complexity of his communications increased he began to put symbols together to express ideas that were his own. More important, many of these ideas could not be expressed by a single symbol alone, or by selecting multiple symbols independently—they could only be conveyed by combining symbols.

For example, Kanzi frequently initiated games of tag. Sometimes we simply tagged him with our hands; other times, the goal was to tag him with a particular object. He began to indicate which version of tag he wanted to play with combinations such as "chase ball," "chase pine cone," "chase water," "chase you," and so on. When he uttered these words in combination, we knew he wanted to play tag with a particular object or person; if he had simply said "pine cone" or "ball," we would not have understood what he wanted to do.

Similarly, Kanzi also began to indicate where he wanted to be carried, using combinations such as "Austin carry" and "childside carry" to say that he wanted to be carried to see Austin or to the "childside." If Kanzi had said only "Austin"

or "childside" as we walked about in the woods, we would have changed the course of travel and gone where he requested but we might not have thought to carry him since we were attempting to encourage him to travel on his own, though in other situations when he asked to be carried we often complied with his request. So if Kanzi wanted to be carried to the "childside," he needed to combine symbols to make this wish known.

Not all Kanzi's combinations involved a verb. Sometimes he formed simple sentences such as "backpack lighter" to ask for the backpack so he could get out the lighter when he wanted to make a fire. He said "trailer ball" to indicate that he wanted to go to the trailer and look for a ball that he had left there. He commented "hot water there" to indicate that he wanted to make a cooking fire by the river, and "childside food surprise" to say that he wanted to go to the childside and get a food surprise. Kanzi often made combinations that were quite different from any that he had ever heard others employ, revealing that he recognized the power of combining words to convey his own ideas and thoughts. For example, if someone became upset over some misbehavior on his part, he often requested a "milk hug" to indicate that he wanted to be held and coddled with milk, while making up. Combinations such as these enabled Kanzi to convey very specific things that single words could not convey, yet they depended less on grammatical rules than on the knowledge of the context for proper interpretation.

Although Kanzi's utterances did not usually require grammatical rules in order to be properly interpreted, by five years of age he was producing symbol combinations with sufficient frequency to permit a systematic analysis of the way in which he ordered words. It was important to look for evidence of grammatical rules in Kanzi's utterances because many linguistic scholars have argued that the utterances of apes should not be characterized as truly linguistic in nature unless it can be shown that they employ grammatical rules similar to those found in human languages. These scholars have also maintained that only human beings are endowed with the ability to organize things according to the categorical relationships between them, and that it is this special ability that makes language possible.

This seemed to me an extreme position. After all, Kanzi had learned to comprehend and use printed symbols on his own without special training. He had also learned to understand many spoken words, even though he himself could not speak. He knew that words could be used to communicate about things he wanted or intended to do, even though those actions were not happening at the time of the communication. He could also purposefully combine symbols to tell us something (for example, something that had happened earlier in the day, when we were not present) we would have had no way of knowing otherwise. He recognized that two symbols could be combined to form meanings that neither symbol in isolation could ever convey. He used this skill to communicate completely novel ideas that were his own and had never been talked about with him. Consequently, whether or not he could be shown to possess a formal grammar, the conclusion remained inescapable that Kanzi had a simple language.

Nonetheless, many scientists continued to insist that until the use of grammatical rules could be shown in his language, the rest of what Kanzi had done was of little

interest. Such an extreme view is taken, I believe, because many scientists are hesitant to conclude that apes are capable of rational thought, foresight, or purposeful communication—behaviors formerly held to be exclusively human. If we allow that apes such as Kanzi are indeed attempting to tell us what is on their minds, and that their minds are shaped by their experiences just as the minds of young children are, we lose our claim to being drastically different from all other creatures on the planet. We also thereby bring ourselves to confront the question of our relationship to other animals. We cannot hold animals fully responsible for their actions, just as we cannot do so with children. Still, we grant children certain rights and responsibilities that are commensurate with their level of intelligence and understanding. We do not consume children as food, operate on them for practice, confine them for public display, or hunt them for recreation.

If we accept that human behavior shares important commonalities with that of the ape, then what should our obligations to apes be? Can we continue to employ them as biological preparations in medical studies? Can we continue to strike down their forest homes with wanton disregard for their survival? These become troubling questions once apes are perceived as creatures who think and feel much as we do. However, if we maintain the comfortable illusion that apes are merely clever imitations of ourselves, with no real understanding of the world they inhabit, then our present treatment of them may seem more palatable. Doubtless there is a strong motivation in current thinking to justify and maintain the perception of apes as mindless caricatures of man.

I realized that I needed to determine whether or not Kanzi was beginning to use any grammatical rules if I was going to convince the scientific community that he was using language creatively. To address this question I looked at a large group of his utterances with the help of Patricia Greenfield, an expert on language development in children. We found that Kanzi was utilizing word order in many of his combinations. Interestingly, sometimes this order followed English word order and sometimes it seemed to be his own. For example, when Kanzi produced action-object combinations such as "hide peanut" or "grab head," he tended to follow the typical English word order of action first, object second. However, when he specified the relationship between an agent and an action, he tended to put the action first and the agent second, for example, "chase you," "grab you."

Standard English, in contrast, places the agent first and the object second. However, when he formed such combinations, Kanzi usually indicated the agents by pointing to them, something that is not characteristic of spoken English. When Kanzi used a proper name, for which he could only use a lexigram, in combinations like "Liz hide" or "Matata bite," he tended to follow English word order. Thus, it is interesting that Kanzi's deviations from English word order occurred mostly when there were also deviations in the mode of expression—that is, they occurred when Kanzi used a gesture rather than a lexical symbol.

Kanzi also made many combinations in which he specified a place that he wanted to visit or an object that he wished to have. In these combinations, Kanzi placed his goal (object or location) first and his action (go, chase, carry, etc.) last. Again, his word order differed from that of spoken English, and again, many of these action words, such as "go" and "chase," were conveyed by gestures. Thus,

we found that whenever Kanzi combined a symbol with a gesture, he tended to place the gesture after the symbol. This was a rule of Kanzi's own making and one that only Kanzi typically followed.

Our analysis suggested that Kanzi had developed some simple grammatical strategies that were indeed based on his recognition of the role that words serve in different communications. Not only did he tend to adopt English word order when he combined symbols, he devised his own rules for combinations of gestures and symbols. Kanzi's communications strongly challenged the assumption that humans alone are able to perform the thought process of manipulating truly arbitrary symbols according to grammatical conventions.

Even though Kanzi's combinations caused a number of linguists to raise their eyebrows in disbelief, the real key to his intelligence was not in what he said but in what he understood. The keyboard provided a vehicle for Kanzi to make his thoughts known, but it was also a limited system. Often the words he wanted to use to form a particular sentence were not on the keyboard, and even though he tried to compensate for this problem, it was not always possible for him to express his ideas, particularly the more complex ones.

More words could be added to the keyboard, but the search time for any given word increased geometrically as the number of available words went up. The more effort Kanzi (or any of us) had to put into searching for a needed word, the less attention could be devoted to planning a complex utterance. Therefore, keyboard utterances, even those of Kanzi's human companions, were rarely longer than two to three words. Forming even short combinations with rapidity in the midst of a communicative act required not only an intimate familiarity with the keyboard but also practice.

New researchers coming to the laboratory often took a year or more to become as sophisticated as Kanzi in the use of the keyboard. If one were to measure the communicative ability of adult humans by their conversational facility with the keyboard, one would severely underestimate their intelligence because of the inherent limitations of a keyboard system. Similarly, we were likely to underestimate Kanzi's capacity. We knew that the communicative skills of human adults went far beyond what we saw them say at the keyboard, because they also spoke. Unfortunately, Kanzi could not speak, so we could not use this skill as an independent measure of his true intellectual capacity.

Syntax Grasped

Kanzi's throat and larynx are not constructed in a manner that permits him to speak clearly, but there is nothing wrong with his ears. He can hear everything that is said around him, just as you and I can. Therefore, we decided to measure Kanzi's language capacity not by what he could say but by what he could understand.

Comprehending the sentences of another person is as complex an ability as producing those sentences; in fact, many regard it as more complex. In most cases, when we speak we know what we want to say. However, the situation is different when we listen to others. Often we do not really know what they want to say. Our

only option is to do our best to understand what they say. Most people do not realize the complexities involved, since when they learn language they are too small and too young to appreciate the difficulty of the exercise.

When we are slightly older, we become familiar with written language. Because we see words written as independent entities, we tend to think of them as discrete units that sound essentially the same every time we hear them. This perception is an illusion. If one looks at a spectrographic analysis or a picture of the vibrations of air molecules as a function of speech, it is clear that there are no neat separations of words. It is impossible to tell by visual inspection alone precisely where one word begins and another ends. Moreover, if we encounter the same word in several different sentences, it never looks the same on the spectrogram.

Knowing what a given pronunciation of "banana" looks like on a spectrogram will not enable you to inspect other spectrograms and identify additional instances of "banana." Yet it is just this sort of feat that we have little trouble accomplishing when we listen to speech or when we read a written text. Knowing what the word "banana" sounds like will enable us to identify it in any novel sample of speech. Similarly, knowing how the word "banana" is written will help us identify it in a novel sample of text, even if we are completely unfamiliar with the rest of the language.

Since spectrograms are not the products of a conventional system of writing but are mechanically produced representations of the physical properties of sound, we have no way of "reading" them. This is one reason why it is so difficult to build a computer that can reliably decode human speech. When one looks at the representation of speech sounds in a spectrogram, it is virtually impossible to tell where each word begins and ends, as there are none of the breaks between words that we are familiar with from writing. Instead, each word appears to merge into the next in a steady stream of represented noise. Yet when one replays the very speech that produced that spectrogram, the word units are easily recognized.

Since Kanzi's ears were okay, we decided to measure his comprehension of language and use our findings as an index of his syntactic capacity. For understanding the utterances of others requires as great a knowledge of syntax as does producing one's own utterance, if not more. We began by noting whenever we observed in ordinary daily events that Kanzi clearly understood something said to him. If people spoke to Kanzi but had to help him understand by pointing or showing him what to do, we took note that such assistance was needed. As we analyzed the data, we concentrated on determining the kind of things he seemed able to grasp without such assistance.

This method limited us to recording instances that could be objectively validated. For example, if we were cooking potatoes and asked Kanzi to help by getting some out of the refrigerator, we could observe his actions to determine whether or not he had understood our request. However, if we told Kanzi we would have some potatoes later at the A-frame, it was not as easy to be certain that he understood this by watching his ensuing actions. Still more abstract sentences—such as "Kanzi, don't you know that potatoes are good for you?"—provided us with virtually no way of measuring Kanzi's comprehension by observing what he did after we spoke. For this reason, we limited our data gathering to sentences relating to actions that could be carried out immediately by Kanzi.

The method also encountered difficulty when Kanzi elected not to do what he was asked to do, even though we believed that he understood our requests perfectly well, or when he elected to do precisely the opposite thing in order to tease us. Nonetheless, we persisted, because when our requests were clear and when Kanzi was cooperative, it was as though a window opened into his mind that gave us a picture of a far more complex creature than we could have discerned by noting only the utterances that he produced.

Our observations suggested that Kanzi understood a wide variety of complex sentences. For example, when he heard "Would you put some grapes in the swimming pool?" he got out of the swimming pool, walked over to where a number of foods were placed on a towel, and picked up the grapes and tossed them in the water. When he knew we were playing a game of hiding surprises, and he heard a clue such as "I hid the surprise by my foot" or "Rose hid the surprise under her shirt," he immediately raced to the correct location and retrieved his surprise. When asked on a walk in the woods, "Would you please give Panbanisha an onion?" Kanzi looked around for a patch of onions and, when he found one, pulled out a bunch and took it back to Panbanisha. When he had a new ball that he wanted to take into the colony room with him when he went to visit Matata, but he was told "Your ball stays here"; he placed it by the door while visiting Matata but of course retrieved it immediately after he left.

One day when Kanzi was visiting Austin, he wanted some cereal that had been prepared specifically for Austin. He was told, "You can have some cereal if you give Austin your monster mask to play with." Kanzi immediately found his monster mask and handed it to Austin, then pointed to Austin's cereal. When told "Let's go to the trailer and make a water balloon," Kanzi went to the trailer, got a balloon out of the backpack, and held it under the water faucet. He needed help fitting it on the faucet and filling it with water, but he had clearly understood the sentence. Even sentences with general terms such as "it" or "this" were easy for Kanzi. For example, sentences like "If you don't want the juice put it back in the backpack" were readily responded to, as were sentences like "Get some water, put it in your mouth."

These examples, and thousands more, nearly all different, collected systematically across time, began to paint a more complete picture of Kanzi's abilities. Kanzi could understand language at least as well as a child two to three years old, perhaps better if the topic was of keen interest to him. These examples suggested that Kanzi had an understanding of grammatical relationships that went considerably beyond the simple combinations he was able to produce.

Moreover, we noted that when Kanzi heard a sentence like "Can you throw a potato to the turtle," he never made mistakes such as throwing both items or throwing the turtle toward the potato. Typically, he either responded correctly, or in some way that suggested he had not clearly heard a specific word but had nonetheless grasped the general gist of what was said. For example, he might throw a tomato to the turtle, rather than a potato, if he were not listening carefully. How-

ever, he almost never made grammatical errors, such as throwing the turtle at the potato. Similarly, in sentences like "Get the hot dogs and put them in the hot water," Kanzi never seemed to think the term "them" should apply to anything other than the noun mentioned previously in the same sentence.

Had Kanzi responded only to simple two-word combinations such as "ball chase" or "go A- frame," his ability to understand grammatical relationships would have remained somewhat questionable. However, when he responded appropriately to sentences such as "Let's play ball chase at the A-frame" by going to the A-frame and then initiating a game of chasing with the ball, it left little doubt that he understood a great deal about relationships between words, even though his own combinations were far less complex.

However, the belief that animals are incapable of such high-level mental activities remained so strong that few critics accepted Kanzi's responses to such sentences as evidence of the true capacity of his mind. They suggested that Kanzi was somehow figuring out what to do based on contextual information, or that subtle, if unintentional, cues were aiding him in undetermined ways.

In response to these concerns, a comprehension test was designed that would permit us to rule out such extraneous factors. I sat behind a one-way mirror and asked Kanzi to carry out a sequence of novel requests. I selected only requests that differed from the kinds of things that Kanzi might hear in the course of his normal daily activities, and I repeated each request only once. Thus, Kanzi could not depend on something he had learned previously, in order to respond appropriately. Kanzi was also the only party who could hear my request, since the other individuals in the room wore headphones that played loud music to drown out anything I said from behind the mirror. Each sentence was presented only one time, and 660 different sentences were presented. Kanzi's response to each request was videotaped.

This test, given to Kanzi when he was nine years old, not only validated my previous impressions of his ability to understand complex sentences but also indicated that earlier data, taken when he was six years old, had underrepresented the range and complexity of the sentence types he had come to comprehend. More important, many of the requests were so unusual that it would have been impossible for him to have responded appropriately the first time he had ever heard such a sentence by any means other than understanding what was said to him. Examples of some of these unusual sentences include:

Put the collar in the water.
Tickle Rose with the sparklers.
Put the tomatoes in the melon.
Give the doggie [a toy dog] some yogurt.
Put a sparkler in the coke can.
Put the toothbrush in the lemonade.
Take the snake [a plastic snake] outdoors.
Put the chicken in the potty.
Put the raisins in the shoe.
Go scare Matata with the snake.

Can you pour the ice water in the potty?
Can you take the gorilla [a stuffed toy] to the bedroom?
Can you brush Liz's hair?
Can you take Rose's shoe off?
Go get the balloon that's in the microwave.
Can you put the blanket on the doggie?
Can you put the bunny [a puppet] on your hand?
Make the snake bite Linda.
Tickle Rose with the bunny.
Drink the coffee that's hot.
Drink the iced coffee.
Go get the noodles that are in the bedroom.
Liz is going to tickle Kanzi.
Go vacuum Liz.
Put on the monster mask and scare Linda.
I want Kanzi to grab Rose.
Use the toothbrush and brush Liz's teeth.
Tickle Liz with the umbrella.
Stab the ball with the sparklers.
Pour the Coke in the lemonade.
Pour the lemonade in the Coke.
Knife the doggie.
Hide the toy gorilla.

Kanzi did not get every single sentence correct, but he was able to properly carry out 72 percent of the requests. His ability to understand such sentences compared favorably with that of a two-and-a-half-year-old child named Alia. Alia responded appropriately to 66 percent of the same sentences. Sometimes Kanzi responded to some of the sentences in a most unexpected manner, but one that was nonetheless correct. For example, when I asked him to "put some water on the carrot," he tossed the carrot outdoors. At first I thought this was a mistake until I reflected on the fact that it was raining very heavily at that moment, and tossing the carrot out into the rain was certainly a satisfactory means of getting it wet. Another time, I asked him to "put some water on the vacuum cleaner," and he picked up a glass of water and began to drink it. Again, I thought he was wrong until I realized that he had not swallowed the water but had filled his mouth full of water and was using his mouth to carry the water to the vacuum, where he then leaned over and dribbled the water out of his mouth into a small hole in the top of the vacuum cleaner.

Sometimes Kanzi misunderstood one or more of the words in the sentence, as his ensuing behavior made clear. For example, when I asked him to "take Liz to the bedroom," he seemed to think I had said the word "knives" instead of "Liz," as both words have a "zz" sound on the end. He picked up a large handful of knives, but I tried to correct him by repeating "Liz, Liz." He then understood the word "Liz" but apparently thought I also wanted him to take the knives as well, so he kept them and headed toward Liz with a handful of knives. This was a bit fright-

ening for Liz, as Kanzi was quite large and was walking bipedally straight toward her with a handful of knives. Since she did not know what I had said (as the test required that she did not hear any utterance) rather spontaneously backed away from Kanzi. This made Kanzi think that perhaps he had not understood me correctly with regard to the word "Liz," so he turned and headed back again toward the bedroom with his knives. I then said, "Get Liz by the hand and take her to the bedroom." In response, Kanzi turned and approached Liz again with his hand held out kindly toward her. This time Liz was not so startled and did not move backward, and Kanzi took her by the hand and led her into the bedroom.

Kanzi also had trouble with the word "can." This is an interesting word in that it is used as a means of forming a question in sentences like "*Can* you open the juice?"; as a modifier, as in "can of Coke"; and as part of a proper noun, as in "can opener" and "trash can." All these different usages seemed to befuddle Kanzi, and he had difficulty ascertaining what was meant when we used the word "can." Consequently, sentences like "Can you use the can opener to open a can of Coke?" left Kanzi dumbfounded. However, more unusual sentences, such as "Can you put the chicken in the potty?" were carried out appropriately, since the puzzling word "can" was not used in several different ways in the same sentence.

Similarly, the word "trash" seemed to be a mystery for Kanzi. We frequently asked him to pick up his "trash" and put it in the backpack when we were outdoors. We also asked him to put things in the "trash can" when we were inside. The only common element of these two different situations was that the word "trash" referred to things that we did not want left in the location where they were. But putting "trash" in a backpack and putting a banana peel in the "trash can" were concepts that constantly confused Kanzi, because we were using the same word in ways that did not seem similar to him at all. Apparently, the idea that we would have a name for things that were going to be thrown away later in time was a concept that lay outside his understanding of how the world worked. Bonobos typically drop their trash wherever they find themselves. If they put something in a container, it is because they want to keep it, not because they want to throw it away later. Kanzi never seemed to understand why some things went in the trash and others did not. Often the trash looked very attractive to him and he wanted to take things out of the trash and play with them. Thus, our idea of what was to be discarded also differed significantly from Kanzi's, further complicating his task of discerning what we meant when we uttered words like "trash can."

Such difficulties should not be taken to imply that Kanzi was unable to cope when the same word was used in different ways. With some words he was able to do this quite well. He had no trouble at all with "water" or "watermelon," for example, or with "dog," "hot," and "hot dog." In each of these cases, even though the same word was used in different ways, the referents for the different words were more concrete and hence more readily grasped by Kanzi.

Alia had similar problems with some abstract words. For example, when she was asked to bring an object during the test, she sometimes brought several things instead of just the item she was asked to retrieve. Her mother attempted to get her to bring only one object by saying, "Just one, Alia, just one." However, Alia did not grasp the idea that "just one" referred to number. She assumed that "just one," was the name of an object, so she brought even more things back to her mother, trying to figure out which thing it was that her mother was calling "just one." The more her mother emphasized "just one," the more objects Alia returned with, in hopes of bringing the right thing. She would hand her mother the objects one at a time, saying "dustin," "dustin," as though to figure out which object was called "dustin." Her mother, exasperated, kept repeating "just one," holding up one finger to try to convey this idea to Alia. But even though this scenario was repeated multiple times during the test situation, Alia never discerned the meaning of "dustin." Some months after she had started to learn to count, the meaning of "just one" did, of course, become clear to her.

Most of the mistakes that Kanzi and Alia made on the test resulted from their failure to grasp the complete meaning that was intended. Typically, their mistakes resulted from confusions between words that were similar in sound, such as "tomato" and "potato" or "orange" and "orang." Other confusions occurred between words that sounded quite different but represented things that, to them, seemed very similar, such as "clay" and "paint."

When either of them made mistakes of this type, they often insisted that they were correct. For example, when I asked Kanzi to "put the paint in the potty," he put the clay in the potty instead. I then tried to help him by saying, "But what about the paint?" emphasizing the word "paint." Kanzi responded by placing additional clay in the potty. I then commented, "Thank you, that was the clay, now could you put the paint, the paint, in the potty." Kanzi then pulled the potty over in front of me and tilted it toward me to show me that, as far as he was concerned, he had done exactly as I had requested. Realizing that he thought clay and paint were essentially interchangeable items, I thanked him for his help and moved on to the next sentence.

Rarely did either Kanzi or Alia make mistakes that indicated a lack of understanding of the basic grammatical structure of the sentences. Both of them readily differentiated between requests to retrieve objects from locations ("Go to location X and get object Y") and requests to take objects to locations ("Take object X to location Y"). They also understood the difference between sentences that required them to move through space in addition to acting on objects and sentences that required them to act on the objects in some way without moving about. The grammatical structure of some sentences was very simple, for example, "Give the ball to Rose." Others were much more complex, such as "See if you can make the doggie bite your ball" or "Show me the ball that's on TV." Switching between these different levels of grammatical complexity seemed to pose few difficulties for either Kanzi or Alia.

Of particular interest, from a grammatical standpoint, was whether or not sentences of the form "Show (or give) me X and Y" (for example, "Show me the ball and the cereal") would be easier for Kanzi than those that were grammatically more complex. To respond correctly to sentences such as "Show me X and Y" requires an understanding that the verb "show" or "give" applies to both objects, but apart from this requirement the sentences are very simple. The listener can show or give

the objects to the speaker in any order, and he or she does not have to construct any sort of relationship between the word "ball" and the word "cereal."

In contrast, a sentence like "Put your ball in the cereal" requires the listener to construct a specific relationship between ball and cereal. A more complex sentence such as "Get the ball that's in the cereal" requires the listener to decode the relationship between ball and cereal that is made manifest by the sentence and to look for a specific instance in the world about him where ball and cereal hold that relationship to each other. If there are balls and bowls of cereal lying about that do not hold this sort of relationship to one another, the listener must not be confused by them, but must look instead for those objects whose extant relationship is precisely that specified by the sentence.

Sentences of this type (Get the X that's in Y) also require an understanding of the principle that subunits of the sentence, for example, "that's in Y," act to modify the meaning of other subunits of the same sentence. In this case, Kanzi must not look for just any ball, but for the ball that is in the cereal. That is to say, the phrase "that's in the cereal" determines how Kanzi must interpret the word "ball"—that is, not just any ball, but a specific one. Linguists typically call such syntactic devices "embedded phrases." In this example, the true meaning intended by the word "ball" cannot be understood without realizing that its meaning is embedded within the phrase "that's in the cereal."

Linguists maintain that only human beings are able to process symbolic information that is structured in such a complex interdependent manner. Kanzi, however, did quite well on such sentences. In fact, he responded correctly to 77 percent of the sentences presented with this structure, while Alia responded properly to only 52 percent of these sentences. The assumption that only human beings can understand complex structural and categorical relationships clearly deserves reevaluation in light of Kanzi's ability to understand such sentences.

Quite unexpectedly, Kanzi experienced the greatest difficulty with sentences that had the simplest grammatical structure, the "Give (or show) someone X and Y" sentences. In these sentences, Kanzi's only task was to listen and give me the two objects mentioned in the sentence. Surprisingly, most of the time, he could remember only one thing. Kanzi correctly responded by giving both things on only 33 percent of such sentences, a performance far lower than he had achieved on other more "grammatically difficult" sentences. Kanzi's problem with these sentences was not a failure to understand but a memory failure.

Kanzi always gave me at least one of the items that I mentioned. Never did he make the error of giving one correct item and one incorrect item. When he responded with only one item to a sentence like "Show me the milk and the doggie," I had only to mention the forgotten item by saying "and the milk," and Kanzi would immediately pick up the milk and show that to me also. It was not necessary to repeat the verb to remind Kanzi that he was to show the object to me.

The fact that Kanzi found grammatically difficult sentences easier to respond to than simple ones suggests that, contrary to the expectations of linguists, structural relationships between words helped Kanzi to decode the speaker's intent. When faced with a sentence that was structurally simple but required that he keep two items in short-term memory while he looked around and decided which ones he was supposed to give, he had trouble remembering both things. Consequently, a sentence like "Show me the doggie and the milk" was more difficult for him than a sentence like "Feed the doggie some milk."

When Kanzi is asked to feed the doggie some milk, an inherent relationship is constructed between dog and milk, which revolves around the action of feeding. However, when Kanzi is merely asked to show these items, no inherent relationship is constructed which would link the dog to the milk. The items simply form a short list. Kanzi's differential performance on sentences with similar words but different structural content indicates that grammatical relationships actually facilitated sentence comprehension and recall for Kanzi, as opposed to making these things more difficult.

In instances where an ape does not perform as well as a child, the difficulties seem to reside either in the ape's failure to comprehend the semantic content of words—for example, "trash can,"—or in a failure to hold in short-term memory a list of unrelated items. The ape's difficulties do not appear to be primarily due to grammatical constraints on sentences uttered naturally by English speakers. Although some grammatical problems may be documented in the future, it is probable that they will arise from a more basic semantic failure to grasp some concept encoded by the grammatical relationships, that is, time, possession, and so forth.

Kanzi's ability to understand language greatly exceeds his ability to produce it. In large measure, this must be because the language he understands is spoken English. However, he cannot speak, so in order to communicate he must point to symbols. The number of symbols available is limited, and to use any one of them, he must search to find what he wants to say. This means that "talking" is far more difficult for Kanzi. If Kanzi could produce vocal speech, he would produce many more complex utterances than he currently does. Perhaps, in the future, a way around this limitation can be found.

What Kanzi Tells Us

In the past, when people have attempted to communicate with animals, they have often focused on teaching the animal to talk. They have taught a vocabulary and then tried to get the animal to use this vocabulary to tell them things. The reason this method has met with such limited success is now clear. Language is learned, not through speaking, but by coming to understand what others say to us. There is enormous complexity in the speech to which children are exposed, and they are immersed in a world of speech for a year or more before they begin to speak at all.

During the first year of life, children cannot speak, even if they understand words, because their vocal-laryngeal tract is too immature to produce all the sounds that characterize human language. Throughout this year, however, people are constantly speaking to them and expecting them to respond in some way to what is said. By the time a child begins to speak its first words, it is already aware of the communicational potential of speech and it has already been exposed to hundreds of thousands of words and sentences. From these early experiences, the child

has learned how to recognize verbal units of various sizes and can understand some of these units in combination with one another.

From this point on, language learning becomes a matter of refining this core of knowledge. By listening to what others say and trying to interpret their intent, the child is presented with all the information needed to figure out language. However, we cannot see the child listening to others, nor can we see it attempting to figure out what they are trying to say. Sometimes, we can tell what it is that children do not understand, because we see them doing something that does not correspond to what they have been asked to do; however, most of the time we do not know what they do or do not comprehend.

While children are being brought up they undergo a long period of exposure to speech, and to its interactional functions, at a time when their brains are rapidly expanding in size and complexity. This exposure provides a sort of experience very different from those that previous investigators interested in language capacities of animals have provided for their animal subjects. Instead of talking to the ape throughout a sensitive developmental period, investigators have typically waited until the ape was old enough to be weaned and then have rewarded it in some way for correctly executing proper responses of some type when shown various objects. Given this enormous difference in the methods of exposure to language, perhaps we should not be surprised that children typically learn language without any special instruction and that, prior to Kanzi, no animal had done so.

What Kanzi tells us is that humans are not the only species that can acquire language if exposed to it at an early age. Humans simply appear to be the only species that can make the proper sounds to actually speak, and thus the only species that has exploited the sound system to a significant degree for communicating novel messages to conspecifics. Perhaps animals other than Kanzi could also understand spoken language if brought up in a similar fashion.

PART II

THEORETICAL AND PHILOSOPHICAL IMPLICATIONS

CHAPTER 3

Rhetorical Inclinations

"Sure, But Does He *Really* Understand What We Say?"

In the first part of this book, Sue Savage-Rumbaugh tells of a number of occasions, many of which were recorded on film, of Kanzi understanding complex sentences of spoken English. In the following passage, she describes some of those occasions.

> For example, when he heard "Would you put some grapes in the swimming pool?" he got out of the swimming pool, walked over to where a number of foods were placed on a towel, and picked up the grapes and tossed them in the water. When he knew we were playing a game of hiding surprises, and he heard a clue such as "I hid the surprise by my foot" or "Rose hid the surprise under her shirt," he immediately raced to the correct location and retrieved his surprise. When asked on a walk in the woods, "Would you please give Panbanisha an onion?" Kanzi looked around for a patch of onions and, when he found one, pulled out a bunch and took it back to Panbanisha. When he had a new ball that he wanted to take into the colony room with him when he went to visit Matata, he was told "Your ball stays here"; he placed it by the door while visiting Matata but of course retrieved it immediately after he left.
>
> One day when Kanzi was visiting Austin, he wanted some cereal that had been prepared specifically for Austin. He was told, "You can have some cereal if you give Austin your monster mask to play with." Kanzi immediately found his monster mask and handed it to Austin, then pointed to Austin's cereal. When told "Let's go to the trailer and make a water balloon," Kanzi went to the trailer, got a balloon out of the backpack, and held it under the water faucet. He needed help fitting it on the faucet and filling it with water, but he had clearly understood the sentence. (See p. 67 of this book.)

The characterizations of these scenes are given by Savage-Rumbaugh in all honesty, spontaneity, and sincerity; but—as her colleagues in the scientific community naturally want to ask—are they in fact *true?* Had Kanzi, in fact, "clearly understood" these sentences? Or, from a scientific perspective, does Savage-Rumbaugh give overhasty, loose, even subjectively biased characterizations of Kanzi's response to hearing these utterances? Do Savage-Rumbaugh's characterizations make up a true and objective representation of what had occurred? Is she in fact justified in characterizing the scenes as she does?

We mustn't let ourselves lose sight of such instinctive, "commonsense" responses to questions like those listed (although, as later sections will argue, we must also be careful in how we interpret those responses). What is so often the case is that the considered, professional responses of scientists are radically different from those of "commonsense." That is, although the four questions listed have been the focus of scientific research for more than thirty years, and although many answers to them have been proposed and strongly argued for, the fact is that none of them has yet been given an answer—positive, negative, or "qualified"—that meets with general agreement in the scientific community. And, although they will not be the focus of this chapter, it is worth adding that the same is true with the related, and no less important, questions concerning the cognitive abilities and behavior of apes: that is, questions concerning the possession of concepts, the attribution of knowledge, the formation of intentions, and so on.

And yet, it is not the absence of agreed *answers* to its central questions that makes the ape language controversy so frustrating. Instead, the source of this frustration lies in the continued lack of agreed *methods of evaluation* (or justification) by which any proposed answers can be assessed. In other words, if, at the end of extensive experimental research, a reputable research team proposes a definitive answer to one of these important questions—for example, asserting that Kanzi understands spoken English sentences of particular grammatical types—there are no agreed methods by which the scientific community can determine whether that conclusion is or is not well founded. There is no agreed standard of scientific proof by which one may determine whether that conclusion deserves to be taken as a valid answer to the question posed: that is, *whether we should believe it or not.*

To put it another way, the lack of agreed answers to the first-order questions listed earlier is matched by—*or rather, is a product of*—the scientific community's inability to arrive at agreed answers to the following second-order, methodological questions:

1'. What observational or experimental evidence would be sufficient for it to be justifiably asserted that an ape understands what a spoken English sentence means?
2'. What would constitute sufficient proof that the signs/lexigrams produced by an ape really mean or refer to something?
3'. What must the researcher show to justify the claim that an ape is following a particular linguistic rule (or set of such rules)?
4'. How could one prove that an ape knows, as we humans know, that language is for communicating thoughts and intentions to others, for speaking truly (and sometimes falsely) of the world, and for attaining particular communicational goals?

Yet as long as agreed answers to these second-order questions are lacking, there will remain no grounds for optimism that consensus answers to any of the first-order questions will ever emerge. Clearly, just as we would need an agreed system of measurement if we wanted to come up with agreed measurements of spatial or temporal phenomena, we also need agreed methods of evaluation if we are

to come up with agreed evaluations of the phenomena that are the subject of ape language research. We need to know what has to be shown if we are satisfactorily to justify a claim about the communicative (or cognitive) abilities or behavior of an ape.

The following analogy will help in further exploration of this dilemma. Some of us are watching a group of children play in a swimming pool below our balcony. We decide, for our own amusement, to give comparative evaluations of the behavior of each of the children in the pool, in the manner of the juries who evaluate professional skating and diving competitions. We agree on a set of five expressions by which to present our evaluations: "very poor," "poor," "good," "very good," and "excellent." And so we begin to write down our evaluations of each child's behavior. However, it quickly emerges that our evaluations are not in agreement but diverge widely. I gave a "very good" to Bobby, but you gave him a "very poor," and another friend gave him an "excellent"; I gave Henry a "very poor," you gave him an "excellent," and our other friend gave him a "good." And so on.

We ask each other to give our justifications for these evaluations. I reveal that I scored Bobby as "very good" because I thought his backstroke and crawl were surprisingly good for a child of his age and because his diving, though a bit ungainly, showed real potential. On the other hand, I gave Henry a "very poor" because his only stroke was a modified dog paddle and he hasn't yet learned to dive head first into the pool. But you explain that you gave Bobby a "very poor" because he was very rough and aggressive with the other children in the pool, he scoffed at the admonitions of the lifeguard, and he refused to wait his turn in the queue at the diving board. On the other hand, you explain that your evaluation of "excellent" for Henry was determined by his courtesy and good manners at poolside and his respectful attitude toward the adults swimming laps in the lanes. Our friend then objects that our evaluations are unjustified and explains her own as follows: Bobby received "excellent" because his imitation of a sea lion was wonderfully nuanced and lifelike, and Henry only received a "good" because his imitation of a killer whale was not particularly inspired (to put it kindly).

These attempts to justify our evaluations reveal that although we have been using the same evaluative expressions—"excellent," "very good," "good," and so on—we have been using different methods of applying those evaluative expressions to the children's behavior; and doubtless this revelation is what explains the wildly different evaluations we arrived at. It also confirms that there would be little point, for instance, in my arguing that you had made a mistake in evaluating Bobby as "very poor" because you failed to take account of his advanced skill in the backstroke, and that the correct evaluation was "very good." Similarly, it would be pointless for you to argue that it was my evaluation of "very good" for Bobby that was unjustified because I had neglected his deplorable poolside manners. For poolside manners are irrelevant according to the method by which I apply those evaluative terms, just as stroke proficiency is irrelevant to the method of evaluation you use (and both these behavioral characteristics are irrelevant to the method of evaluation our friend uses). We may be using the same ordered set of evaluative expressions, but we are still using different methods of evaluation because we apply those expressions according to different criteria. Thus, if you and I are

asked to justify using, say, the expression "very good" to characterize a child's behavior, we will each refer to different aspects of the child's behavior as providing the criteria that justify our uses of that expression.

Nor, of course, can it make any sense to compare our different evaluations. Is your "excellent" a *better* evaluation of Henry's behavior than our friend's "good," given that you each used different methods of evaluation? Is my evaluation of Henry's behavior as "very poor," based solely on his stroke proficiency, comparable with your and our friend's evaluations, based as they were on poolside manners and animal-imitative skills? How could such comparisons make any sense?

Evaluating the poolside behavior of children is only a form of amusement in our community, so it really doesn't matter too much whether we ever do agree on a common method for doing so. But this is not the case with the communicative and cognitive behavior of apes and humans. If science is to make any headway in investigating the abilities of apes, we must be able to compare different scientists' uses of linguistic, behavioral, psychological, gestural, communicational, and cognitive terms, that is, what I will call the set of metaexpressions that includes the metalinguistic terms *understands*, *refers*, *means*, *sentence*, *language*, *warns*, *says*, and so on. We must also be able to compare how they use these terms when they talk about *humans* and how they use them when they talk about *apes*. Furthermore, for both comparisons, the uses of these metaexpressions must be evaluated according to the same method of evaluation: regardless of who is using those expressions or whose abilities—a human's or an ape's—they are being used to describe. Unfortunately, the fact that all the investigators of human and ape abilities draw from roughly the same set of such metaexpressions—yet without an agreed method of applying them—is highly misleading. For using the same set of metaexpressions promotes the illusion that meaningful comparisons *can* be made between one scientist's assertion that *his* bonobo "understands" a given sentence and another scientist's assertion that *her* bonobo does not or, for that matter, between one's assertion that by a certain word a chimpanzee "means x" and another's assertion that the same word "means x" to a human.

What sense, for example, are we to make of the critics' refusal to accept Savage-Rumbaugh's assertions that Kanzi understood the English sentences reported in the quoted passage that opens this chapter (or that he understood the sentences on which he was tested in the laboratory)? Are the critics using the same method of evaluation as Savage-Rumbaugh in determining whether she is justified in asserting that, in this or that particular instance, "Kanzi understood"? Furthermore, do the critics (and, for that matter, does Savage-Rumbaugh) also use that method of evaluation when determining if it is justified to assert the same thing of *a human*? Or is it merely that the same metalinguistic expressions are being used—"understood," "did not understand," and so on—yet, in each case, are being applied according to different justificational criteria?

If the critics and Savage-Rumbaugh are using the same metalinguistic expressions but are applying them according to different criteria, then (as in the poolside analogy) different methods of evaluation are in use. In this case, it would be illogical to claim that the critics are denying what Savage-Rumbaugh says, that is,

denying *the very same proposition* that is asserted by Savage-Rumbaugh. (Are you denying the same proposition that our friend is asserting when she claims that Bobby's behavior at the pool is excellent and you reply that no, it's not excellent? Rather, it would appear that, because of the different methods of evaluation being used, the assertion and the denial "pass each other by.")

Similarly, if scientists use the same set of metalinguistic expressions when talking about the abilities of both apes and humans *yet apply those expressions according to different criteria when talking about apes than when talking about humans*, then, again, different methods of evaluation are in use: one for metalinguistic discourse about apes and one for metalinguistic discourse about humans. In this case it would clearly be illogical to claim that it is the same propositions that are being affirmed—or denied, or contrasted—for both humans and apes. If we have used different methods of evaluation in determining whether it is justified to say, on the one hand, of Kanzi and, on the other, of my friend Stuart that they understood the sentence "Would you put some grapes in the swimming pool?" then it would make no sense to conclude, for instance, that Stuart did but Kanzi did not understand that sentence, or for that matter that they both did or both did not.

And if one scientist's assertion does not logically make contact with the other's denial (because, as in the present case, the scientist and her critics are employing different methods of evaluation), does it even make any sense to *hope* that—by looking more closely at the data, or by reexamining the behavioral phenomena directly, or by improving the data collection techniques, and so forth—we can find out which of them is right? Without agreed methods of evaluating the use of such metaexpressions—the terms for describing, evaluating, characterizing, and comparing behaviors and abilities—a rational, responsible, *scientific* investigation of those behaviors and abilities cannot even begin.

One must instead conclude that a method of evaluation for metalinguistic claims about animals must satisfy two *logical prerequisites*: a Commonality Requirement and an Equality requirement, as follows.

Commonality Requirement: The same method of evaluation must be used by all who judge whether it is justified to assert a given metalinguistic claim.

If this requirement is not satisfied, then it makes little sense to compare how one judge (using one method) evaluates the justification of a metalinguistic claim with how another judge (using a different method) evaluates the justification of that same claim.

Equality Requirement: The same method of evaluation must be used in evaluating metalinguistic claims about both apes and humans.

If the Equality Requirement is not satisfied, then it cannot make any sense to compare how a claim was evaluated (by one method) when it was asserted about an ape with how it was evaluated (by another method) when it was asserted about a human. If we want to know whether an ape can do what we do (e.g., understand a particular sentence), then whether it is justified to claim that an ape has some communicational ability must be determined in the same way that it is determined whether it is justified to make that same claim about a human.

It is not as if the lack of an agreed evaluative method has gone unnoticed in the scientific community. Far from it. As discussed earlier, many within the scientific community have expressed great frustration at the fact that little or no progress has been made, in over three decades of research, toward the goal of forming consensus answers to first-order questions such as those numbered 1 to 4 above. Furthermore, it has long been recognized that this lack of agreement on the first-order questions has been rendered unavoidable because of the lack of agreement on the second-order, methodological questions. And recognition of this connection has naturally led to periods of increased attention to the methodological issues and to the goal of establishing agreed methods of evaluation that satisfy both the Equality and Commonality Requirements. However, in spite of all the attention these issues have received, that goal continues to remain tantalizingly beyond the reach of the scientific community.

One should not forget, of course, that it is in the interest of some schools of opinion that no agreement on a common method of evaluating such abilities should ever be reached. There are many scientists who, for one reason or another, refuse *on principle* to accept even the possibility that a nonhuman ape could share any of the communicational or cognitive abilities of a human, or less-evolved versions of them. For someone who wants dogmatically to maintain the presupposition of a fundamental, unbridgeable, categorical distinction between the communicational/cognitive abilities of humans and of apes, the continuing lack of agreement on a common method of evaluating those abilities can appear to confirm that presupposition. That lack of agreement can appear to confirm the presupposed incommensurability of ape and human abilities.

In chapter 2, Stuart Shanker examines the historical development and philosophical underpinnings of the attempts by cognitive psychologists and philosophers of mind to grapple with these methodological problems. He analyzes the concepts and arguments that these theorists have employed in their efforts to found a common metric, or method of evaluation, for the scientific community's investigations of the cognitive abilities of humans and apes. Yet Shanker reveals the existence of deep-rooted, *epistemological* presuppositions that act like hidden magnets, magically guiding those who work on these problems to the same sterile, irresolvable controversies: controversies that, because of their frustratingly perennial character, take on the appearance of fundamental *philosophical* issues. Shanker also shows how Savage-Rumbaugh's work can be seen both as shedding new light on these longstanding methodological problems and as suggesting a means of dissolving their puzzling character. In the remainder of this chapter I want to adopt a different perspective on these problems, on their epistemological presuppositions, and on the implications that Savage-Rumbaugh's work with apes has for their resolution: a perspective from which the sources of the methodological problems, as well as their solution, appear as rhetorical matters.

What do I mean by "rhetorical," and how does rhetorical analysis differ from the philosophical analysis given in the last chapter? The best way I can answer this question is by illustrative example, beginning in the next section. But the following remark from Wittgenstein's *Philosophical Investigations*, although it addresses the methodological problems plaguing not cognitive or communicational

theories but the philosophy of mathematics, nevertheless gives a good idea of the kind of material a rhetorical analysis concerns: "What we 'are tempted to say' . . . is, of course, not philosophy; but it is its *raw material*. Thus, for example, what a mathematician is *inclined to say* about the objectivity and reality of mathematical facts is not a philosophy of mathematics, but something for philosophical treatment" (Wittgenstein 1953, sec. 254; emphasis added). It is in the raw material of these *rhetorical inclinations*—that is, in what, typically, "we are tempted to say" in talking about the abilities and behavior of humans and animals (and in *why* we are tempted to say it)—that one may find both the source of the scientists' frustrating inability to arrive at common methods for evaluating those abilities and behaviors and the tools with which one may begin to treat that inability.

The Commonsense Picture of Communication

To understand the methodological problems that plague scientific discourse on the communicational abilities of *apes*, one must first examine the rhetorical characteristics of scientific discourse concerning *human* communicational abilities: that is, scientific discourse that makes use of the kinds of metalinguistic expressions just discussed. Consider, for instance, the following metalinguistic remarks, which could hardly be said to be controversial.

A. We usually (but not always) understand what we say to each other.
B. To understand someone's utterance, we must understand what it means.
C. All, or at least most, of the words we use mean something.
D. In speaking we often refer to things and/or ideas.
E. The truth or falsity of what we say depends on how the things we refer to really are.
F. There are other people who speak the same language we do.

Any number of commonplace metalinguistic remarks could be added to these: remarks such as "To converse successfully with another speaker, we must use the same language"; "It is possible for two people to give different pronunciations to the same word"; "If we know a given language, we know many, perhaps all, of the ways its words may be combined into sentences"; "We use language to communicate our thoughts to others"; and so on. The highlighting of the six metalinguistic remarks listed is not intended to be significant.

Anyone who denied the truth of these remarks would typically be called a skeptic. That is, only a skeptic would maintain that:

A'. We don't usually understand what we say to each other.
B'. We don't have to understand the meaning of someone's utterance in order to understand that utterance.
C'. The words we use don't mean anything at all.
D'. We don't ever refer to things.
E'. The truth or falsity of what we say is in fact independent of how the things we refer to really are.

F'. Even though we take there to be millions of speakers of English, this is incorrect. In fact, there are not now and never have been two people who speak the same language.

There is an internal relation between, on the one hand, the fact that someone who denied claims like A to F would typically be characterized as a "skeptic" and, on the other, the fact that the claims themselves would typically be characterized as "commonsense": that is, they are like two sides of the same coin. Accordingly, those who study human communication are inclined to treat the skeptic's denial of such claims as controversial and to dismiss the skeptic's argument as "an assault on commonsense." (On the rhetoric of skepticism in language theory, see Taylor [1992].)

Intrinsic to characterizing claims like A to F as "commonsense" is taking them to be *true*. (Thus another word for a statement of commonsense is a "truism.") Moreover, as is reflected in claim E, we are inclined to view the truth of a sentence—for example, "The Earth has only a single moon"—as determined by facts that are independent of the utterance of that sentence: in this case, the fact that there really is only one of the things we call "moons" revolving around our planet. Analogously, we take the truth of the claims A to F to be determined by the fact that things really are as those claims declare them to be. Again, only someone who would typically be called a skeptic (or relativist) would deny this and affirm instead that a sentence may actually be true even if things are *not* in fact as the sentence says they are.

Take claim C as an example: "All, or at least most, of the words we use mean something." It is surely a "truism" that *if it really were the case that the words we use did* NOT *actually mean anything, then C would be false.* That is, the truth of C is determined by the fact—a fact that is independent of the utterance of C—that the words we use *really do* have meanings. Accordingly, C strikes us not just as some groundless platitude nor as something we are just "inclined to say"; rather, we take it as actually corresponding to "the real facts" about our words. Commonsense inclines us to the view that we don't just *say* that our words mean something; they really do.

In other words, the distinction between a sequence of sounds meaning something and not meaning anything is not one that we are inclined to take merely as a *de dicto* distinction: that is, a verbal illusion that is created by—is a "construct" of—the ways in which we metalinguistically talk about those sounds. Instead, we treat the distinction between meaning something and not meaning anything as *de re*. That is, when we say that a sequence of vocal sounds means something or doesn't mean anything, we take what we say to be true only if the facts of the matter are actually as described: the sequence really does (or does not) have a meaning. By extension, the same goes for the other statements A to F and for other similar metalinguistic "truisms." I will use the expression "the commonsense picture of communication" to refer to the general conception of communicational "facts" that is implied by the taken-for-granted truth of such commonsense metalinguistic statements. This picture of the reality underlying human communicational behavior is a rhetorical legacy of our inclination to treat such metalinguistic statements as "truisms."

On the other hand, it is no surprise that scientists of human communication typically "tinker with" or "reinterpret" some of the features inherited from this commonsense picture of communication. A communication theorist may deny that we are justified in assuming, say, that we usually understand what we say to each other (see claim A); on the contrary, she may insist that much of the time all that we really are justified in assuming is that our interlocutors do not radically *mis*understand what we're saying. Or a sociolinguist may object that no two people really speak the very same language (see claim F); rather, the language spoken by any one of us is only more or less similar to that spoken by others in our community and is less similar to that spoken by people living at a greater social or geographical distance from us. And so on. But what is most important is that only someone whom the scientific community would typically ostracize as a "radical skeptic" would want to reject the *basic outlines* of the commonsense picture as the foundation, the core set of assumptions, from which to begin serious inquiry into human communicational phenomena. Moreover, it is quite understandable that this is how we are inclined to respond to such radical linguistic skepticism; for if we gave in to it, we would be unable to carry on.

This last point needs explaining. Imagine that, every time you and I meet, I make a point of denying (and behaving in accordance with that denial):

- That you understand anything I say
- That I understand anything you say
- That the words we are using mean or refer to anything
- That either of us knows the meanings of any of the words we're using
- That the truth of what I or you say depends on the facts
- That you and I are speaking the same language

It seems clear that if I talked and behaved in this way it would pose a serious, probably insuperable obstacle to our interactions. How could we go on—what communicational goals could we possibly achieve—if I persisted in acting thus? How could we plan to meet somewhere, explain where and how we hurt, give each other road directions, ask for help, complain about our treatment, and so on, if to everything you said I responded as if I believed that your words do not mean or refer to anything, that the truth of what you said is independent of how things really are, and that you and I are not speaking the same language? And if this were how I treated what *I* said as well? Simply trying to envisage such an interaction brings one very quickly to a frontier with the unimaginably absurd.

Now, consider if *everyone* began to act as I do, and did so *all the time*. Everyday communicational interaction—and so, human life as we know it—would collapse.

The importance of this point needs to be emphasized, for it explains our attachment to what I have called the commonsense picture of communication. It is not because we are naive, or stupid, or theoretically uninformed "folk" that we attribute the status of truism to metalinguistic remarks like A to F and that we consequently accept the general outlines of the commonsense picture projected by those truisms. The attribution of an authoritative status to such metalinguistic statements strikes us as a prerequisite to "ordinary life," as is made clear by the

attempt to imagine what life would be like if we rebelled against that authority. And the acceptance of some version of the commonsense picture of communication seems to follow naturally. We are therefore strongly inclined to think that to deny that those truisms *were true*, that they gave a more or less accurate description of "the way things really are," would itself amount to challenging their authoritative status and therefore also the stability and comprehensibility of ordinary life. (For a demonstration of the kind of thing that would occur were the authority of such commonsense "truisms" challenged, see the famous experiments recounted in Garfinkel [1967, ch. 2].)

In sum, "commonsense"—here illustrated by claims A to F—provides scientific inquiry into communicational abilities with a powerful rhetorical legacy (that is, what Wittgenstein called *raw material*). This legacy takes the form of a rich, albeit vague and incomplete, picture of the reality ("the facts") underlying human communicational behavior: a reality that is populated with such things as meanings, languages, referential relations, grammatical rules, states of understanding and of misunderstanding, and so on. Those scientists who study human communication are thus strongly inclined to take for granted (at least *some version* of) this picture, along with the premise that (some as-yet-unspecified version of) the reality pictured *must* obtain. For example, it must be the case that we humans often refer to things with the words we use. This must actually *happen*; it's not just something we *talk about*. Words, at least some of them on some occasions, really do refer to things. Reference (or meaning, or languages, or understanding, etc.) are not just imaginary creations, with a purely *de dicto* existence. They are *de re*: phenomena that "exist in the world."

Animal Research and the Scarlet Letter

How does the commonsense picture of communication influence the methodological problem raised earlier: the problem of how to determine whether an ape like Kanzi understands a spoken English sentence? It is clear that the rhetoric of metalinguistic discourse about humans inclines us toward the view that the distinction between a person who does and a person who does not understand a given sentence is not merely a *de dicto* distinction. That is, that it is not a distinction that exists only in how we metalinguistically talk about those people. Instead, we are led to the view that the distinction between understanding and not understanding is *de re*. When we say P understands and Q does not understand, that verbal distinction is correctly applied *only if the facts of the matter are actually as described*: P really does and Q really does not understand. (We might use as a shorthand way of referring to the *de re* distinction: "P does *in fact* and Q does not *in fact* understand.") Furthermore, that rhetoric also inclines us toward the view that, *ceteris paribus*, we typically get it right when we say of someone that he or she understands. In other words, that ordinarily, although hardly universally, when we say that someone understands us or that we understand him or her, we truly describe what really is the case.

But what about apes? Does any ape ever really understand something said to it by another ape (via gesture, or vocalization) or, in the case of laboratory-reared

apes like Kanzi, something said to it by a human? Can we justifiably ever claim of any ape that it does *in fact* understand a sentence of English? When researchers such as Savage-Rumbaugh assert that an ape understands something they've said, are such claims ever actually true?

To see why understanding-claims about apes are treated as they are, one needs first to look at the broader rhetorical differences between metalinguistic discourse about humans and metalinguistic discourse about nonhuman animals *generally*. It is hardly viewed as unusual when someone who has a pet dog makes a commonplace remark like:

G. His barking means he wants us to take him for a walk.
H. He knows what I am scolding him for.
I. He understands that we are talking about going to the vet.
J. He knows what "naughty" means.

However, the scientific community does not characterize it as "skepticism" when a scientist objects that such commonplace remarks are unwarranted, or even false. The scientific community would never treat such a scientist as a skeptic if he insisted that there is no justification in attributing meaning to the vocalizations of a dog, or in describing the dog as knowing what an utterance refers to (e.g., the puddle on the carpet), or in speaking of the dog as understanding a human sentence or word.

Indeed, not only is it perfectly acceptable—among those researchers who study the abilities and behavior of nonhuman animals—to treat with skepticism any commonplace remarks about animal communication; it is an obligation. A skeptical attitude is a rhetorical requirement for those who want to be accorded a respected status in animal research. That is, whereas human communicational inquiry eschews a skeptical attitude toward commonplace metalinguistic remarks, in animal communicational inquiry the situation is the reverse. A special ostracizing label is attached to the animal researcher who is thought to be *insufficiently* skeptical in her attitude toward commonplace remarks about animal communicational behavior. This special label—which begins, coincidentally, with the same letter as Hester Prynne's notorious brand—is the adjective "anthropomorphic."

A good scientist of animal communication is required to adopt a skeptical attitude toward commonsense remarks (such as G to J) about the communicative behavior of animals. This requirement manifests itself in the norms of primatological discourse, in the rules that are enforced by, among, and on primatologists who study communication and cognition in nonhuman primates. These rules are taught to those coming into the field. They determine what may and what may not acceptably be said, what may count as justification of a given claim, what may count as evidence, what may count as a strong argument, or a plausible hypothesis, and so on. Furthermore, it is by the use and enforcement of these norms that the decisions are made determining how research programs in primate communication are set up and directed, which proposed programs receive funding, whose papers get published in which journals, and who gets tenure. At the same time the requirement to be skeptical is manifested in the demand that Savage-Rumbaugh provide a special justification for her claims about Kanzi understanding spoken English sentences.

It is often possible to find this obligatory disciplinary skepticism hidden behind some dissembling remark in which the scientist concedes that metalinguistic claims such as G to J are indeed acceptable *in colloquial contexts*. However, the scientist continues, in the context of *serious* inquiry such claims are patently nonserious. With more than a little condescension, he corrects the speaker of G, saying something like the following:

> Well, no, actually his barking doesn't really mean anything at all. Rather, the description of the animal's behavior as having a meaning—although perfectly acceptable in colloquial speech—is strictly incorrect. It is in fact only a metaphor. Yet when we have the scientific goal of discovering and stating the truth—as opposed to displaying a sentimental affection for our pets—such a figurative description of the dog's behavior manifests a dangerous intrusion of emotion into the crucial scientific practices of empirical observation and description. Strictly speaking—and scientific inquiry obliges us to obey strict norms of language-use—there is no justification in attributing meaning to the vocalization of a nonhuman animal.

Yet it goes without saying that only someone who would be dismissed as a "crazy skeptic" would raise an analogous objection to a remark about a human's communicative behavior, such as "Barbara's comment about the lateness of the hour means she wants us to end the meeting soon."

> Well no, actually her vocalizing doesn't really mean anything at all. Rather, the description of a human's behavior as having a meaning—although perfectly acceptable in colloquial speech—is strictly incorrect. It is in fact only a metaphor. Yet when we have the scientific goal of discovering and stating the truth—as opposed to displaying a sentimental affection for our friends—such a figurative description of a woman's behavior manifests a dangerous intrusion of emotion into the crucial scientific practices of empirical observation and description. Strictly speaking—and scientific inquiry obliges us to obey strict norms of language-use—there is no justification in attributing meaning to the vocalization of a human animal.

What is the reason for such rhetorical asymmetry? Why isn't the skeptic's denial of commonsense remarks such as G to J viewed as disdainfully in the study of animal communication as is, in the study of human communication, the denial of the commonsense remarks in A to F? The answer lies in the different ways that such skepticism would fit with, on the one hand, our treatment of animals and, on the other, our treatment of our fellow human beings. It seems clear that our day-to-day interactions with and life with animals would not be severely affected by the adoption of the scientist's skepticism about the ability of animals to understand, refer, mean, deceive, intend, etc. Indeed, the converse is more likely: that is, a wholesale *rejection* of that skepticism about animal abilities—analogous to the commonsense rejection of skepticism about the ability of humans to understand, refer, mean, and so on—would not sit at all well with the ethical presuppositions of our treatment of animals as exploitable sources of food, free labor, clothing, cleaning agents, jewelry, and so on. How could we possibly believe that it had been scientifically established that an animal such as Kanzi does in fact have all the abilities that we might "loosely" speak of him as having—the ability to understand some of what we say, to have beliefs and knowledge like ours, to think

thoughts like ours, to communicate something like we do—yet continue to treat him as being without rights and to act as if it is we who have the right to do with him whatever we choose?

Yet, as the skeptic's response to Barbara's remark makes clear, the situation is quite different when we turn to consider the hypothetical consequences of a wholesale skeptical denial of our *fellow human beings'* communicative abilities. While the commonplace adoption of a skeptical attitude to everyday metalinguistic remarks about humans would constitute a dangerous threat to the metalinguistically mediated understanding of human behavior that is essential to our participation in and maintenance of social life as we know it, this is not the case for the adoption of a skeptical attitude toward everyday metalinguistic remarks about animals. It is here that one may find the source of the rhetorical asymmetry between scientific discourse about the communicational and cognitive abilities of animals and scientific discourse about human possession of those abilities.

The Epistemological Conception and Its Methodological Legacy

In the preceding sections, I have proposed a rhetorical analysis as a way of making sense of the scientific community's evident inclination, on the one hand, to adopt a skeptical attitude toward claims about the communicational abilities of animals, yet on the other, to dismiss as absurd the skeptical treatment of similar claims regarding humans. When addressing the philosophical and methodological problems raised by the study of animal cognition and communication, it is to this *raw material* that one should turn. By this means one may shed light on the source and continued vitality of those problems in order to determine how they may best be treated. The goal of this rhetorical approach is to *change* how the scientific community views those problems so that they no longer appear as insuperable obstacles standing in the way of progress in the study of animal abilities and behavior.

But how does this rhetorical analysis affect how one views the methodological problem discussed earlier—the problem of establishing, for the purposes of scientific inquiry, a common method for evaluating metalinguistic claims about apes, both human and nonhuman? How, for instance, can it help us address the second-order question 1'?

1'. What observational or experimental evidence would be sufficient for it to be justifiably asserted that an ape understands what a spoken English sentence means?

We are inclined to conceive of such questions as epistemological matters. That is, it strikes us as little more than a commonsense truism to maintain that there is a particular state of affairs that obtains (indeed *must* obtain) when it is asserted truly that someone understands a sentence: namely, the person in question understands the sentence referred to. He or she does *in fact* understand. So, for example, when we remark metalinguistically, "Stuart understands 'Would you put some grapes in the swimming pool?'" it is the fact, and only the fact, of Stuart's under-

standing that ultimately could determine whether what we metalinguistically assert is true. If that state of affairs obtains, then what we say is true; and if it does not, then what we say is false. Again, this reasoning is hardly controversial, but can be seen as following from the commonsense interpretation of a truism like "If 'He understands the sentence' is true, then he does *in fact* understand the sentence." It is not only the members of the *scientific* community who would regard as perversely skeptical anyone who persisted in denying such an obvious truism.

Analogously, only if the planet Saturn really has seven moons is the assertion "Saturn has seven moons" true. Commonsense tells us that what matters for the truth of that assertion is not whether some, or even all, people feel it's all right to say that Saturn has seven moons, but whether the state of affairs *claimed* to obtain *really does* obtain—whether there are *in fact* seven of the things called moons circling the planet we call Saturn.

Given this reasoning, it is hardly surprising that, when a methodological question like 1' is raised, we tend to assume that what is at issue is information about the obtaining or nonobtaining of a hypothetical state of affairs—*the ape's understanding of the spoken sentence*. What we need to know, it appears, is whether this *de re* state of affairs does or doesn't obtain: whether the ape does or doesn't *in fact* understand the sentence (not just whether people *feel it's all right to say* he does, but whether *he really does*). For as commonsense unambiguously confirms, only the obtaining of that state of affairs can justify the assertion that the ape understands the sentence. Only then is the assertion *true*.

Consequently, we naturally take question 1' as asking how much and what kind of evidence we need in order to determine whether that hypothetical state of affairs does in fact obtain. (Compare: How much and what kind of evidence do we need in order to determine whether Saturn does in fact have seven, and only seven, moons?) It is by these rhetorical means that we are inclined toward what I have called an *epistemological conception* of methodological questions like 1'. We conceive of such questions—that is to say, we treat them—*as matters of knowledge about hypothetical states of affairs*: here, about an ape's understanding of a sentence. We may not be able to observe directly whether that state of affairs obtains, but we can gather evidence to help us determine whether it does: that is, to determine whether the ape does *in fact* understand.

This is what an epistemological interpretation takes to be at issue in question 1'. And so naturally this is also how the scientific community is inclined to conceive of the problem of formulating a common method of evaluation for metalinguistic claims. In other words, it is felt necessary to impose an essential requirement on any attempt to formulate such a method of evaluation. *Any proposed method must be based on one particular kind of justificational criterion: the provision of sufficient evidence to establish that the hypothetical state of affairs that the metalinguistic statement is about does in fact obtain.* A method of evaluation must evaluate as justified only those metalinguistic claims that satisfy this criterion. Thus, for example, any method of evaluation that determines that it is justified to assert that Kanzi understands a particular English sentence must base that determination on evidence showing that Kanzi does *in fact* understand that sentence. Again, this requirement is nothing more than commonsense: Would it not be absurd to deny that if an assertion is to be confirmed as true, then the state of affairs asserted to obtain must actually be shown to obtain?

Still, how much evidence, and of what kind, is required for us to know whether the ape does *in fact* understand? (Not merely whether the ape *acts like* he understands, or whether people who observe him *feel it's okay* to say he understands; but whether he does *in fact* understand.) In other words, exactly how should we formulate the criterion for the method of evaluating claims about the communicational abilities of animals? Exactly what type or types of observational evidence should be accepted as sufficient to justify the claim that, for example:

- An ape understands the spoken sentence "Would you put some grapes in the swimming pool?"
- An ape follows the grammatical rule requiring subjects to be placed before verbs?
- An ape knows what "easy" means, or that it is the antonym of "difficult"?
- An ape uses symbols to refer to things?

And there is a corollary to this requirement: the criterion must be applied equally to apes and to humans. If it is not, then—as I showed earlier—different methods of evaluation are being used, so the Equality Requirement is not satisfied. The consequence in turn would be that metalinguistic assertions about an ape (evaluated by one method) cannot be compared with similar assertions (evaluated by a different method) about a human, even though the same metalinguistic terms are being used. That is, it would be illogical to maintain that what was being affirmed of the human was the same thing that was being affirmed (or denied) of the ape—that the ape and the human both understand the meaning of the word "please"; or that the human can, but the ape cannot refer to past events. *For such comparisons to have any sense, the same methods of evaluation must be applied.*

After all, what the scientific community wants to know is whether any ape does or can be taught to do *the same* (communicational) things that we humans do: understand sentences, grasp the meanings of words, use language to refer to objects and events, follow grammatical rules, and so on. To answer these questions (positively or negatively), a method of evaluation that satisfies the Equality Requirement must be used. Otherwise, the answers given will only be pseudoanswers.

It is of course here that the opinion of the scientific community divides into many opposing schools and subschools of thought, with the result that no method currently in use yet satisfies the Commonality Requirement. However, it is essential to recognize that underlying these frustrating divisions over methodology, and the consequent pessimistic outlook for research on the communicational abilities of animals, is a shared rhetorical premise: the *epistemological conception* of the problem of formulating a method of evaluation for metalinguistic claims about animals. For it is by presenting the problem as a matter of knowledge, of sufficient evidence, and of the states of affairs for which evidence is required, that the epistemological conception sows the rhetorical seeds of that discord. In other words, the frustrating methodological divisions—and so the obstacle to progress in the study of animal communicational abilities—are a rhetorical legacy of the epistemological conception of the problem of an evaluative method. ("*Qui sème*

le vent récolte la tempête.") If the problem were conceived differently, that disagreement simply could not arise. In the following sections I will attempt to make these last points clear by means of illustrative examples.

But first, it is perhaps worth recalling why the methodological problem of evaluating understanding-claims about apes does not independently arise for understanding-claims about humans: that is, independent of science's attempt to determine if animals have any of the communicational abilities (such as understanding) that we humans have. For, *prima facie*, one might think that having to justify the claim that Kanzi understands "Would you put some grapes in the swimming pool?" is no different from having to justify the claim that a human understands that sentence. After all, it is certainly possible that either of them might *act like* they understand yet not really do so, or that common opinion might *take it to be acceptable* to describe them as understanding although in fact they really do not. For each of them, the same state of affairs has to be shown to obtain—it has to be shown that the ape or the human does *in fact* understand. Therefore, determining what kind and how much evidence is sufficient to justify either claim should, at least in principle, present the same sorts of methodological problems and offer the same room for disagreement and division. However, this is clearly not the case; and that is because rhetorically the two claims, and so also the two justificational tasks, are quite different. In other words, we "are inclined" to see them differently, as follows.

As I showed earlier, it is a cornerstone of commonsense that, all things being equal, people usually understand sentences spoken to them in a language that they themselves speak. Only someone who would naturally be deemed a skeptic would maintain that usually people do *not* understand sentences spoken to them in their language. Therefore—again, all things being equal—my English-speaking friend Stuart can be expected to understand the sentence "Would you put some grapes in the swimming pool?" (Of course, things might not "be equal." For instance, Stuart might never have seen a grape before, or he may not have heard me clearly. And so on. But we are here making the a priori assumption that all things *are* equal.) Consequently, if Stuart acts like he understands that sentence when it is spoken to him (e.g., he gets right up and puts the grapes in the swimming pool), the onus is naturally placed on the skeptic to establish *her* claim that, in spite of appearances, Stuart does not really understand. And we may go one step further. For if we are rhetorically entitled to assume from his behavior that he understands the sentence, then we may infer that the relevant state of affairs does in fact obtain: that is, the state of affairs that, according to the commonsense picture, *must* obtain *if* he really understands the sentence. In other words, the rhetoric of metalinguistic discourse places the onus *on the skeptic* to establish that someone who acts like he understands a sentence does not *in fact* understand it.

However, for the reasons already discussed, rhetoric inclines us differently when the subject is not a human but an ape. In this case, it is "anthropomorphic" to assume that Kanzi, or any ape, *can* understand an English sentence. Therefore, we cannot assume—as we could with Stuart—that, all things being equal, Kanzi will understand the sentence "Would you put some grapes in the swimming pool?" That is, even if Kanzi acts like he understands it (e.g., behaving just as Stuart did),

the onus is placed not on the skeptic, but rather *on the ape language researcher* to establish that he does *in fact* understand it. Thus arises the problem of formulating a method by which such claims may be established and which, at the same time, satisfies the Equality Requirement.

Methodological Reductivism

According to the epistemological conception, metalinguistic claims are matters of knowledge about the obtaining of *de re* states of affairs. Moreover, we already *know* that we humans understand, mean, refer, and so on. But do we know that any ape does or can be taught to do these things? As I have shown, we are led by the epistemological conception to require *any method of evaluating such claims to be based on one justificational criterion: the provision of sufficient evidence to establish that the hypothetical state of affairs that the metalinguistic statement is about does in fact obtain.* However, the criterion is no more precise than this. As such, it leaves open two crucial matters.

To put it another way, the required justificational criterion incorporates two structural "variables": an Epistemic Object variable and an Epistemic Conviction variable. Each of these variables can be expressed as a question.

1. Epistemic Object variable: What is the hypothetical state of affairs that the metalinguistic statement is about and that must be shown to obtain?
2. Epistemic Conviction variable: What counts as sufficient evidence to establish that the state of affairs in (1) obtains?

These two variables provide the locus for the superficially radical divisions between theoretical schools on how to formulate a method of evaluation for metalinguistic claims about animals. (Those divisions are only *superficially* radical because there remains the underlying epistemological conception.) The divisions may be traced to the different "values" that different schools give to these "variables": what they count as "sufficient evidence" and what they take to be "the hypothetical state of affairs" that has to obtain for the metalinguistic claim to be true. The choices for these "values" foreground the rhetorical relationship between the method of evaluation and the commonsense picture of communication.

Put in this way, it becomes possible to see why the methods that have been proposed for evaluating metalinguistic claims about animals fall into two general types, which are distinguished by their opposite choices of values for the two structural variables. One type of method is characterized by the choice, as Epistemic Object, of a *de re* state of affairs, the obtaining or nonobtaining of which is relatively simple to establish. Such a reductive method of evaluation is typically adopted in those forms of communicational research that are based on what are usually called "behaviorist" principles.

A reductive method of evaluation for a claim such as "She or he understands S" might determine a subject's understanding sentence S to consist in the subject making one of a particular set of bodily movements in response to hearing S. For example, an experimenter might determine the subject's understanding of the sen-

tence "Press the red button" to consist in the subject pressing the red button in response to hearing that sentence. In other words, this act is what the metalinguistic claim "The subject understands 'Press the red button'" is deemed *to be about*: the Epistemic Object. It is this, and only this, *de re* state of affairs that must obtain for the metalinguistic claim to be true; and it is therefore this state of affairs that must be *shown* to obtain if the method of evaluation is to evaluate the claim as justified.

What this example brings into relief is the rhetorical relationship between the Epistemic Object and Epistemic Conviction variables. In particular, it reveals how, by defining the Epistemic Object in this reductive manner, the problem of Epistemic Conviction is greatly simplified. For it is a relatively straightforward matter to collect evidence to see whether the subject presses the red button in response to hearing the sentence "Press the red button." Therefore, *if* behaving thus has been defined as the state of affairs that the metalinguistic statement is about (i.e., as the Epistemic Object), then it is just that simple to produce evidence sufficient to establish whether that state of affairs does or does not obtain. In other words, *given this type of broadly reductivist method of evaluation*, the researcher can much more easily establish whether a metalinguistic hypothesis—such as "The subject understands 'Press the red button'"—is true. Consequently, if such a method of evaluation for metalinguistic statements about apes were commonly accepted in the scientific community, it would be much easier to reach widespread agreement on the answers to a host of modern science's most puzzling metalinguistic questions, such as questions 1 to 4 posed earlier. If each communicational ability that we wanted to know about could be given such a behavioral definition, then the search for those answers would be a relatively simple matter of seeing whether the ape produced that behavior in the appropriate conditions.

There is no doubt that this reductive approach to the problem of formulating a method of evaluation for metalinguistic claims offers certain procedural benefits to scientists studying the communicational abilities of apes. As I have shown, science wants to determine whether an ape has or can acquire some of the very same communicational abilities that we humans have, as opposed to fundamentally distinct abilities that we—perhaps misleadingly—characterize by the same metalinguistic expressions. So if we are to make any sense of metalinguistic claims affirming or denying that an ape possesses one or more of the communicational abilities typically associated with humans, those claims must be evaluated according to the same method of evaluation as is applied to the affirmation or denial of the same metalinguistic claims of a human: the Equality Requirement must apply. This means that if this reductivist type of method of evaluation is employed in determining whether it is justified to affirm *or deny* a particular communicational ability *of an ape*, then the same method of evaluation must also be employed to determine if it is justified to affirm or deny that same ability *of a human*. Here is the problem.

Of course, it is perfectly *possible* to choose particular behavioral states or events as Epistemic Objects for most metalinguistic claims typically made about humans: for example, to identify the act of pressing the red button as the state of affairs that the metalinguistic claim "She or he understands 'Press the red button'" is about. If we make this methodological choice, then only if the human subject presses the red button on hearing "Press the red button" will that metalinguistic claim be evaluated as justified. It is as feasible to choose a behavioral Epistemic Object for a metalinguistic claim about a human as it is to do so for a metalinguistic claim about an ape. But whether it will seem to us to make much sense is another matter.

But why should this be? For, as I have shown, commonsense inclines us to the view that, all things being equal, someone who *acts* like they understand a sentence, does *in fact* understand it. And, in parallel fashion, if someone *acts* like they do *not* understand the sentence, we are inclined to accept that, in fact, they do not understand it. So a reductive method of evaluation would appear to sit well with our commonsense inclinations.

However, "all things" might not "be equal." Commonsense also inclines us to leave open the *possibility* that although someone acts like she understands, she may not in fact really understand. And we take it also to be *possible* for her to act like she does *not* understand, even though she really does. In other words, we are inclined to preserve a distinction between *acting as if* one understands a sentence (or means such-and-such by what one says, or is referring to a particular object, or is following the rule R) and *actually doing so*. We make room for the possibility that even though Barbara did not press the red button on hearing "Press the red button," she may still have understood the sentence perfectly correctly. But a reductive method of evaluating metalinguistic statements abolishes this distinction, and so this possibility, by fiat.

Would it not indeed strike us as absurd if someone insisted on the absence of any distinction here? Imagine if I tell Charlie that even though Barbara acted like she understood his request to leave the dog in the car, she didn't really understand what he said; and to justify this superficially skeptical remark, I point out that Barbara had had her Walkman on quite loud when Charlie spoke and that she always leaves the dog in the car anyway. But Charlie objects to my claim as nonsense: for according to him, the fact that Barbara acted as if she understood the request logically guarantees that she did in fact understand it. She *cannot possibly* have failed to understand it, for her understanding is nothing more and nothing less than her behavioral response. Or imagine the opposite scenario: I tell Charlie that even though Barbara acted like she hadn't understood his request to leave the dog in the car, she had in fact understood what he said perfectly well. To justify my claim, I point out that she is quite angry with him and so was doubtless doing the opposite of what he requested "just to spite him." But then Charlie objects that, no, Barbara's acting as if she hadn't understood makes it *impossible* for her actually to have understood. For her lack of understanding *consisted in* her behavioral response.

It is hard to imagine what the effect would be on everyday life if everyone ordinarily argued for and acted in accord with the positions that Charlie here supports. No one would act as if there were any distinction between talking about communicational behavior and talking about the communicational states and processes (e.g., understanding, meaning, referring, following rules, intending, etc.) that—in the real world—we typically speak of as underlying or motivating that behavior. If everyone were to act this way, then there would no longer be any sense to our everyday talk about reasons for someone's behavior, what someone

really thinks, justifications for someone's actions by reference to their understanding of the situation, and so on. What is clear is that "everyday life as we know it"—or rather, the variety of practices by which we reflexively make sense of our lives to ourselves and to each other—does rely on that distinction; hence its status as "commonsense." Have we not often had the experience of finding out that someone who acted like he understood what we said did not really do so? Or that someone who acted like she was referring to one object was in fact referring to another? Or that someone who behaved as if he were following a particular rule was really following another (or no rule at all)? Making sense of these experiences requires the very distinction that is abolished by a reductive method of evaluating metalinguistic claims.

However, we must not confuse two different issues here. Commonsense does indeed incline us to place the *rhetorical onus* on skeptics to establish their case: that is, to show that someone who acts as if she understands does not actually do so. Yet we are also commonsensically inclined to preserve a distinction between *acting as if* one understands and *actually doing so*. In fact, these two issues do not conflict. On the contrary, if it is to make any sense to place the rhetorical onus on the skeptic to establish his claim that someone who acted as if she understood did not really, then we cannot do away with the metalinguistic distinction between acting as if one understands and actually doing so. For the sense of the former practice logically requires the latter distinction. It is essential to our commonsense concepts of understanding, meaning, referring, and so on (i.e., all those things that science wants to know if an ape can do) that acting as if one is doing one of these things is logically distinct from actually doing it. But a reductive method of evaluation does away with this commonsense distinction by decree.

At the same time, commonsense also inclines members of the scientific community to put the rhetorical onus on the *animal researcher* to prove that an animal who acts as if it understands a particular sentence does in fact do so. Remember the reaction of the scientific community to Savage-Rumbaugh's claims that Kanzi understood the English sentences in the episodes reported in the passage quoted at the opening of this chapter. To Savage-Rumbaugh's critics, the fact that Kanzi *acted as if* he understood the sentences only promotes the *illusion* of his linguistic competence. But, the critics insist, there are other possible explanations for that behavior: contextual information, inadvertant cuing, prior training, nonlinguistic associations, and so forth. What is still required is proof that he *really* understood the sentences.

A reductive method of evaluation invalidates this requirement; for if the animal acts as if it understands, then there simply is no possibility that it does not. If Kanzi pushes the red button in response to the sentence "Press the red button," then *ipso facto* the metalinguistic claim that he understood the sentence is true, for, according to a reductive method of evaluation, his understanding consists in nothing more and nothing less than that behavioral response. The same is true of his behavioral responses to "Would you put some grapes in the swimming pool?" or "Rose hid the surprise under her shirt" or "Would you please give Panbanisha an onion?" or other sentences mentioned earlier. A reductive method of evaluation can therefore appear paradoxically anthropomorphic; for it leaves no logical room for skepticism regarding a metalinguistic claim about an animal. While it satisfactorily fulfills the requirements imposed by the epistemological conception of metalinguistic discourse, still, because of how it *challenges* our inclinations toward metalinguistic claims about both animals and humans, a reductive method of evaluation clashes with commonsense.

At this point the proponent of a reductive method of evaluation might say "Okay, so reductivism clashes with commonsense, in particular by abolishing the distinction between acting as if one understands and really understanding. But is commonsense necessarily *right*? Maybe it's *wrong* to make such a distinction? After all, science has a long and distinguished history of correcting mistaken concepts and distinctions that commonsense had long inclined us to adhere to."

But what determines "right" and "wrong" here? What might make it *right* (or, for that matter, wrong) for a method of evaluation to take the metalinguistic claim "She understands S" to be about someone's behavioral response to the sentence S but *wrong* (or right) for it to take that claim to be about a state of affairs that is distinct from the behavioral response? According to what standard are we to judge how to apply the terms "right" and "wrong" to a method of evaluation, and why should we accept that standard *itself* as right?

As I have shown, the theorist of communication is free to establish any method of evaluation that she or he chooses: for instance, a method according to which it would be judged "wrong" to draw a distinction between "acting as if one understands" and "really understanding" and "right" not to do so (or vice versa). However, one does not succeed in grounding that choice by appealing to another super- or metamethod: that is, a method that would determine whether that choice of method of evaluation was itself "right" or "wrong." For such a metamethod would also stand in need of justification. Consider the analogy: nothing could make it inherently right to apply metric rather than British standard conventions in measuring lengths. That choice could only be judged right by reference to another set of conventions. So, it is right to apply metric conventions in France, where social and governmental conventions require the use of the metric system. But what makes *those* conventions right? What *could* make them right, except another set of meta-metaconventions: for example, a United Nations convention enforcing the use of metrical conventions on all member governments? But again, what, except another set of conventions, could make that convention right? What matters is that there is nothing in the nature of lengths or in acts of measurement that could possibly make using the metric system inherently right; for "right" is a normative term whose use can only be grounded within a normative practice.

Similarly, although one may freely choose to apply a reductive method in evaluating metalinguistic claims, nothing could determine that the choice of that method is "right"—*or* that it is "wrong"—except another method (i.e., meta-method) of evaluation. So, according to the conventions—perhaps of some scientific association—one might be required to use only reductive methods of evaluation; any other method would be automatically judged "wrong". But then that metamethod would itself stand in need of evaluation as the "right" meta-method to apply. (Why should that scientific association's conventions be judged the "right" conventions?) And so on, *ad infinitum*.

Ultimately, what is demanded of a method of evaluating metalinguistic claims is that it enable the scientific community to determine whether it is justified to claim that an ape can do some or all of the communicational things that commonsense inclines us to believe that we humans do. Seen from this perspective, a reductive method of evaluation appears only to *pretend* to tackle this important assignment. That is, what a reductive method seems in fact to be doing is

1. Determining whether it is justified to claim that an ape can produce some of the same *behaviors* that we humans typically produce and then
2. *Rebaptizing those behaviors with metalinguistic labels, such as "understanding," "referring," "meaning," "following rules," and so on.*
3. The result is that it looks as if what had been determined, in (1), was that it was (or was not) justified to claim that an ape can do one or more of the communicational things that we humans can do—things that we typically call "understanding," "referring," "meaning," "following rules," and so on.

From the perspective of the commonsense picture of communication, a reductive method of evaluation thus seems to accomplish its assigned task by means of a rhetorical trick: amounting to something like pulling a metaphysical rabbit out of a behavioral hat. Analogously, it is not our use of the same evaluative terms that determines whether the evaluations you and I make of the children's swimming behavior is logically comparable. For we might be applying those terms according to different criteria. That is, we might be using different methods of evaluation. But, even if we were using different methods, it would still be relatively easy to deceive an onlooker to our judging ceremony, making him think, for instance, that the fact that you and I both give "very good" to Peter and "very poor" to Jim means that we agree in our evaluations of the children's behavior.

Similarly, the reductive method makes use of the same set of metalinguistic expressions as does commensense metalinguistic discourse; so it *appears* to produce metalinguistic claims that are comparable to the metalinguistic claims that we make in everyday discourse: for example, a claim that some person understands what was said or that she is referring to what happened yesterday. Both sets of claims appear to be about the same things and to assess them according to the same method of evaluation. But, because the reductive method applies those expressions according to different criteria from those applied in commonsense discourse (e.g., abolishing any distinction between acting as if one understands and actually understanding), different methods of evaluation are therefore in use. In this case, the claims produced by applying a reductive method cannot sensibly be compared with those to which we are inclined by commonsense. Because different methods of evaluation are being applied, different things are being talked about. A reductive method cannot tell us whether an ape or a human "understands the sentence," as we typically take that metalinguistic expression to mean (i.e., as we apply it) in everyday discourse. But this is what we want to know: to find out whether, like we humans, an ape can understand a sentence. Yet a reductive method can only tell us whether an ape or a human behaves in a certain way, although it will go on to characterize that behavior with the same metalinguistic expression "understands the sentence." Consequently, it is difficult to resist the impulse to affirm that, while such a method can establish whether apes and humans can *behave* alike, nevertheless the scientifically important questions—those about communicational abilities that the method was asked to solve—are all left unanswered.

However, this conclusion does *not* amount to the nonsensical claim that a reductive method of evaluating metalinguistic claims is wrong. For there is nothing inherently wrong about applying expressions differently from how they are applied in everyday discourse. There is nothing inherently wrong in studying the production of behavioral acts and then referring to those acts with metalinguistic terms whose use is differently evaluated in everyday discourse. But what this conclusion does mean is that a reductive method cannot easily satisfy the Commonality Requirement. To the extent that any method of evaluation shifts away from the commonsense picture of human communicational abilities, the scientific community—whose approach to communicational research, as I have shown, is rhetorically derived from that picture—will be comparatively less inclined to be persuaded that that method or any of its evaluative conclusions make sense. And so, also, the scientific community will be less inclined to adopt that method as a standard evaluative metric in communicational research. This tendency may well be reflected in the fact that while behavioristic methods are used frequently in the study of animal behavior, there has been and continues to be strong resistance to their use in the study of human abilities.

Methodological Operationalism

As I have shown, two structural variables are generated by an epistemological conception of what is required of any method for evaluating metalinguistic claims about apes. What I called the Epistemic Object variable is the focus of the rhetorical strategy underlying a reductive method of evaluation. The rhetorical strategy motivating the other main method of evaluation focuses instead on what I called the Epistemic Conviction variable. This strategy is directed at the question of what should count as sufficient evidence to establish the obtaining of the state of affairs that the metalinguistic claim is about.

I have argued that the Epistemic Conviction variable is a straightforward matter for a reductive method of evaluation. For a reductive method chooses as the Epistemic Object a *de re* state of affairs, the obtaining of which may be shown relatively simply. That is, it is comparatively easy to find "hard" empirical evidence to show that that *de re* state of affairs obtains—evidence that would be deemed sufficient, even according to the most rigorous scientific standards. Nevertheless, while a reductive method simplifies the matter of Epistemic Conviction, the cost incurred by this strategy is paid for in its clash with commonsense over the choice of Epistemic Object.

The rhetorically opposite strategy to reductivism is "operationalism," for an operational method of evaluation eschews any conflict with commonsense over the choice of Epistemic Object: the choice of the state of affairs that must be shown to obtain if a metalinguistic claim is to be evaluated as true. For instance, if an operational method is to evaluate as true the metalinguistic claim "Kanzi understands

'Would you put some grapes in the swimming pool?'", then it will not in principle be sufficient merely to establish that Kanzi *acts as if* he understands that request. According to an operational method, if that claim is true, then he must *in fact* understand the request, regardless of how he behaves. And so this is what an operational method requires to be established if the metalinguistic claim is to be evaluated as true. In other words, an operational definition of "understanding a sentence" preserves, and even draws on, the commonsense distinction between acting as if one understands and actually understanding. Similarly, it conforms with our inclination to distinguish between acting as if one is referring to an object, acting as if one means what one says, acting as if one is following a given rule, acting as if one knows what language is for, and so on, and *actually doing so*.

However, by rejecting a reductive "solution" to the problem generated by the epistemological conception, an operational method is left with the thorny matter of Epistemic Conviction: *What should a method of evaluation count as sufficient evidence to justify a claim that the state of affairs that must obtain for the metalinguistic claim to be true, does in fact obtain?* In particular, how much and what sort of evidence is *sufficient* to establish such a claim? Clearly, this question is made especially difficult by the distinction between acting as if one understands and actually understanding. Finding sufficient evidence for the former is one thing; for the latter, the task is more daunting. To this problem must be added the fact, as I have already shown, that the rhetorical onus is on she who *affirms* a communicative ability of an ape: the truth of that affirmation must be established beyond the reach of skeptical doubt. Given this further requirement, the task of determining how much and what kind of evidence is sufficient may well appear impossible.

Faced with this challenge, the operationalist makes a crucial preliminary move: he changes the question. The orientation of the question is reversed, so that it poses not an *inductive-evidential* problem but a *deductive-explanatory* one. In other words, instead of asking how much of what sort of evidence would be sufficient to establish inductively that the required state of affairs obtains, the operational strategy asks: *Given that a certain behavioral act (or pattern of acts) occurs, the obtaining of what state of affairs would best explain that occurrence?* But how can answering this question provide a means of accomplishing the task set by the Epistemic Conviction variable? How can it help determine what evidence should be taken as sufficient to establish the claim that a given communicational state obtains?

Suppose that current theory holds that the occurrence of behavioral act (or pattern of acts) B is best explained by the metalinguistic claim that communicational state C obtains. For example, every time Stuart is given the request "Press the red button," he is observed to respond by pressing the red button in front of him (act B); on these grounds, the theory concludes that the best explanation for Stuart's behavior is that he understands the request (i.e., communicational state C obtains). It should be clear how this kind of approach simplifies the problem of Epistemic Conviction. For, given the theory's conclusion and the grounds on which it is based, the production of act B will constitute powerful evidence for the claim that state C obtains. If the fact that C obtains is what will best explain an occurrence of B, then doesn't it follow to take the occurrence of B as strong evidence of the obtaining of C?

"Strong" and "powerful" evidence, yes; but not logically conclusive. So the question would seem to remain: Is the evidence *sufficient*? Consider the following illustrative example, excerpted from Cheney and Seyfarth's influential *How Monkeys See the World* (1990). They begin by noting that the vervet monkeys that they and others studied "certainly seemed to be using (alarm) calls to denote external referents"—that is, to refer to the predators in the surrounding area (1990, 104). They cite Struhsaker (1967) to support this observation. They note, furthermore, that "in human language . . . the referential function of signals is not in doubt" (1990, 109). But can the same thing justifiably be said of a vervet's signal? Do the vervets' alarms *really* function in this way as well? Do their signals really denote external referents (the approaching predators), in the manner *we know* human signals do?

More to the point, *how do you tell* if vervets' alarms really denote external referents? How can it be established whether such a communicational state obtains: that is, the communicational state that must obtain if the metalinguistic claim "Vervet alarm calls denote external referents" is true? In an experimental test you might be able to determine that a particular vervet *acts as if* the alarms have a referential function; but how much of what sort of evidence would be sufficient to establish—in the face of skeptical doubts—that that is what is *actually* the case?

To answer this difficult metalinguistic question, Cheney and Seyfarth (1990, 9) apply a method they describe as "operationally" based. That is, they transform the question from an evidential issue into an explanatory one (106): How can we best explain the way a vervet behaves when she hears an alarm call? Accordingly, they designed a test of various explanatory hypotheses by means of playback experiments. In these experiments, the authors artificially reproduced the alarm calls in order to see "how variation in a call's acoustic features and variation in other contextual events affected the monkey's responses to a particular vocalization" (106). The authors then examined the experiments' results to see which of the explanatory hypotheses best fit the monkeys' behavioral responses. Only one of the four hypotheses put forward, that which I have italicized in the quoted passage that follows, explains the alarms as having a referential function. According to Cheney and Seyfarth's theory of reference, if alarm calls denote particular external referents, then each such alarm will elicit a consistent set of responses, with each such set being solely a function of the vocalization's acoustic form.

> Playback experiments allowed us to test these alternative explanations. . . . If vervet alarm calls were simply general alerting signals, the monkeys should have responded in similar ways to all of the acoustically different calls. If call meaning was determined primarily by context, then the response to each alarm should have varied depending on the context in which it was presented. By contrast, *if each call's meaning was determined largely by its acoustic features, a given call type (leopard, eagle, or snake alarm) should have elicited a functionally consistent set of responses regardless of the context in which it was presented.* Finally, if calls conveyed information primarily about the emotional state of the caller and only secondarily about the type of predator that had been seen, it should have been possible to blur the distinction among responses to the different call types by varying acoustic features associated with a signaler's level of excitement. (106–7)

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Faced with this challenge, the operationalist makes a crucial preliminary move: he changes the question. The orientation of the question is reversed, so that it poses not an *inductive-evidential* problem but a *deductive-explanatory* one. In other words, instead of asking how much of what sort of evidence would be sufficient to establish inductively that the required state of affairs obtains, the operational strategy asks: *Given that a certain behavioral act (or pattern of acts) occurs, the obtaining of what state of affairs would best explain that occurrence?* But how can answering this question provide a means of accomplishing the task set by the Epistemic Conviction variable? How can it help determine what evidence should be taken as sufficient to establish the claim that a given communicational state obtains?

Suppose that current theory holds that the occurrence of behavioral act (or pattern of acts) B is best explained by the metalinguistic claim that communicational state C obtains. For example, every time Stuart is given the request "Press the red button," he is observed to respond by pressing the red button in front of him (act B); on these grounds, the theory concludes that the best explanation for Stuart's behavior is that he understands the request (i.e., communicational state C obtains). It should be clear how this kind of approach simplifies the problem of Epistemic Conviction. For, given the theory's conclusion and the grounds on which it is based, the production of act B will constitute powerful evidence for the claim that state C obtains. If the fact that C obtains is what will best explain an occurrence of B, then doesn't it follow to take the occurrence of B as strong evidence of the obtaining of C?

"Strong" and "powerful" evidence, yes; but not logically conclusive. So the question would seem to remain: Is the evidence *sufficient*? Consider the following illustrative example, excerpted from Cheney and Seyfarth's influential *How Monkeys See the World* (1990). They begin by noting that the vervet monkeys that they and others studied "certainly seemed to be using (alarm) calls to denote external referents"—that is, to refer to the predators in the surrounding area (1990, 104). They cite Struhsaker (1967) to support this observation. They note, furthermore, that "in human language . . . the referential function of signals is not in doubt" (1990, 109). But can the same thing justifiably be said of a vervet's signal? Do the vervets' alarms *really* function in this way as well? Do their signals really denote external referents (the approaching predators), in the manner *we know* human signals do?

More to the point, *how do you tell* if vervets' alarms really denote external referents? How can it be established whether such a communicational state obtains: that is, the communicational state that must obtain if the metalinguistic claim "Vervet alarm calls denote external referents" is true? In an experimental test you might be able to determine that a particular vervet *acts as if* the alarms have a referential function; but how much of what sort of evidence would be sufficient to establish—in the face of skeptical doubts—that that is what is *actually* the case?

To answer this difficult metalinguistic question, Cheney and Seyfarth (1990, 9) apply a method they describe as "operationally" based. That is, they transform the question from an evidential issue into an explanatory one (106): How can we best explain the way a vervet behaves when she hears an alarm call? Accordingly, they designed a test of various explanatory hypotheses by means of playback experiments. In these experiments, the authors artificially reproduced the alarm calls in order to see "how variation in a call's acoustic features and variation in other contextual events affected the monkey's responses to a particular vocalization" (106). The authors then examined the experiments' results to see which of the explanatory hypotheses best fit the monkeys' behavioral responses. Only one of the four hypotheses put forward, that which I have italicized in the quoted passage that follows, explains the alarms as having a referential function. According to Cheney and Seyfarth's theory of reference, if alarm calls denote particular external referents, then each such alarm will elicit a consistent set of responses, with each such set being solely a function of the vocalization's acoustic form.

> Playback experiments allowed us to test these alternative explanations. . . . If vervet alarm calls were simply general alerting signals, the monkeys should have responded in similar ways to all of the acoustically different calls. If call meaning was determined primarily by context, then the response to each alarm should have varied depending on the context in which it was presented. By contrast, *if each call's meaning was determined largely by its acoustic features, a given call type (leopard, eagle, or snake alarm) should have elicited a functionally consistent set of responses regardless of the context in which it was presented.* Finally, if calls conveyed information primarily about the emotional state of the caller and only secondarily about the type of predator that had been seen, it should have been possible to blur the distinction among responses to the different call types by varying acoustic features associated with a signaler's level of excitement. (106–7)

After describing the playback experiments used to test these hypotheses on the vervets, Cheney and Seyfarth report their results. Predictions of the third explanatory hypothesis are borne out: "each type of alarm call . . . elicited a distinct set of responses" (1990, 107). They conclude by explaining these results as follows: "Each type of alarm call refers to, or denotes, a particular type of predator. Different types of alarms are distinguished by their different acoustic properties and convey a meaning that is relatively independent of the context in which they are given" (110).

Let us return to the general question. Even if we grant Cheney and Seyfarth's argument that the best way to explain how the vervets behave is to attribute a referential function to their calls, the question still remains: Is that behavior sufficient evidence to establish the claim that the vervets' alarms do *in fact* refer to types of predators?

At the very least, we must recognize that there are two quite different questions here:

1. The question whether the claim that communicational state C obtains (e.g., that vervet calls have a referential function) is *the best explanation* for behavioral pattern B (e.g., the behavior observed in the playback experiments)
2. The question whether B is *sufficient to establish the truth* of the claim that C obtains.

Particular kinds of evaluative techniques are applied to the issue of determining which of all candidate explanations is *the best* for a given set of behavioral data. According to this "language game" of behavioral explanation, whether we can justify that one explanation is the best explanation for behavioral pattern B will typically depend on such matters as: how that explanation accords with current theoretical opinion; whether any other explanations have been proposed for B; whether there are any means of experimentally falsifying the proposed explanation or its competitors; and what one counts as an explanation (as compared to a description, or a reformulation, or an interpretation, etc.). At the limit, the explanation may qualify as "the best" merely by default because no alternative explanation has been proposed.

Given these evaluative techniques, it is understandable that Cheney and Seyfarth might be taken to have confirmed that their explanation of the vervets' observed behavioral patterns is indeed "the best": that is, their metalinguistic claim that the vervets' alarm calls have a referential function. Be that as it may; nevertheless, it remains the case that the observation of those behavioral patterns does not guarantee the truth of that claim. For, as the excerpts quoted reveal, the argument supporting that explanation contains two components. There is, first, the following conditional hypothesis, linking communicational state C with the production of behavioral pattern B:

> *If the calls have a referential function (C), then each call will elicit a functionally consistent set of responses from the vervets (B).*

Second, there is the observation, in the playback experiments, of the vervets' production of a functionally consistent set of responses to each call—the observation of B.

Yet, even if we grant the truth of that conditional hypothesis and accept the results of the playback experiments—which, together, would typically be taken to establish the explanatory claim—nevertheless, the observation of behavior B cannot logically guarantee the truth of the claim that C obtains. For the hypothesis does not state that B can *only* be produced when C obtains. *If C, then B* does not imply *If B, then C*. Nor has the latter been shown. (It's difficult to imagine how it could be shown, unless the obtaining of communicational state C could be independently identified; but in this case there would be no need of a method of metalinguistic evaluation.) The possibility is therefore left open that *B is the effect of some other cause*. The vervets may behave as they do for some reason other than that claimed by Seyfarth and Cheney: that is, their claim that vervet calls denote external referents. They may *act as if* their calls denote external referents, even though this is not *in fact* the case. Neither the truth of the conditional hypothesis nor of the experimental results is sufficient—singly or jointly—to establish the truth of the claim that the vervets' calls have a referential function. Yet what is needed, under an epistemological conception, for a method of evaluating metalinguistic claims is *sufficient evidence* to establish the truth of such claims.

In this case, one must reconsider the question already raised. How can the operational strategy of converting a question about evidence into one about explanation determine what evidence should be taken as sufficient to establish the claim that a given communicational state obtains? How can it accomplish the rhetorical task set by the Epistemic Conviction variable?

The answer is that, by converting a question about evidence into an explanatory question, *the operational strategy makes it possible to shift the onus of proof from the ape language researcher*—who affirms the metalinguistic claim—*to the skeptic*, who denies that that affirmation is justified. As we have seen with the Cheney and Seyfarth example, the metalinguistic claim that C obtains (i.e., vervet calls have a referential function) at least provides *a* coherent explanation of the production of the act B (i.e., the vervets' responses to those calls). And it is an explanation, moreover, that has been judged "the best," according to the kinds of evaluative techniques just discussed. Were we simply to accept a skeptical appraisal of that metalinguistic claim, the judgment reached by the application of these techniques would be invalidated, and we would no longer have any similarly validated explanation of why B occurred at all. Indeed, those very evaluative techniques—and any other conclusions they have led us to—would themselves be put into question.

Therefore, within the "language game" of behavioral evaluation, any explanation that has been validated by that language game's evaluative techniques will always be rhetorically preferred to no explanation at all. And the onus will be on he who denies that explanation to demonstrate that another one should be evaluated as "even better." "Sure, it's possible to criticize this explanation and the strength of its evidential support. For every explanation is open to some skeptical criticism. But until you come up with a better explanation of your own to replace it, it cannot be overturned." In other words, unless the skeptic can come up with a "better" (according to the evaluative techniques of the language game) explanation for B's occurrence—that is, an explanation that does *not* affirm the obtaining of C—

the metalinguistic claim that C obtains will retain its rhetorical validation. And this validation will be extended to the behavioral evidence supporting that claim. Given this reasoning, if the skeptic wants to argue that that evidence is not in fact sufficient to establish the metalinguistic claim, the onus is on her first to provide a "better" explanation of the behavior which that claim is taken to explain.

So, how specifically would an operational approach help us formulate a method for evaluating a metalinguistic claim about an ape? Suppose one wants to formulate a method of evaluation to determine whether it is justified to claim that Kanzi really understands the request "Press the red button" or whether, as the critics insist, he is merely behaving *as if* he understands it (that is, whether, as Steven Pinker insists, Kanzi "just doesn't get it" [Pinker 1994, 340]). According to the epistemological conception, we have to determine what behavioral evidence would be sufficient to justify the claim. Suppose, furthermore, that current theory tells us that the kind of behavior that the metalinguistic claim "She or he understands 'Press the red button'" *would be the best explanation for* is the following: on hearing the request, the addressee presses a red button. Given these imaginary circumstances, an operational approach would lead us to choose the occurrence of that behavioral response as sufficient evidence to justify the claim. And, if Kanzi did indeed respond to the request by pressing the red button, our method of evaluation would determine that the metalinguistic claim is justified. At least until a "better" explanation could be found.

As the last remark suggests, an operational method of evaluating metalinguistic claims about apes remains vulnerable to a particular kind of rhetorical strategy: a strategy that has been used to great effect in generative linguistic critiques of ape language research. Suppose that an operational method takes the production of act B to be sufficient to establish the claim that communicational state C obtains, and that it does so because the claim that C obtains has been shown to be the best way to explain why B occurs. However, imagine a critic objects that if communicational state C really obtains, then not only will it be possible to observe act B being produced, but also acts D and E. For example, if someone really understands the request "Press the red button," then not only will she press the red button when requested to do so (act B), she will also point to the red button when asked "Where is the red button?" (act D) and will refrain from pushing the red button when requested "Don't press the red button" (act E).

Does an ape do these things too, the critic asks? For *any human* who understands the request to "Press the red button" will also be able to perform these two acts D and E as well. What if the ape cannot? Isn't that a good reason to question whether "He understands the request" really is the best explanation for his behavior? Wouldn't a *better theory* of understanding than the one we have been operating with so far tell us that "He understands the request" is the best explanation of behavior B *only if* the subject produces behaviors D and E as well? In this case, it would be more parsimonious—and, for this reason, "better"—to replace that explanation with one that explains what the ape does as something short of *full* understanding: call it "quunderstanding" (by analogy to what Kripke [1982] calls "quaddition," an arithmetical function similar to "real" addition). Quunderstanding would be a communicational state of affairs that is somewhat similar to real understanding, except that it does not enable the subject to respond to sentences in the two further ways described. If all an ape has been shown to do is quunderstand a sentence, then we still really do not know whether he can actually *understand* a sentence as we humans do.

Criticism of this rhetorical type has in fact been addressed to Savage-Rumbaugh's claims about Kanzi's ability to understand sentences. For example, in his article "Can an ape understand a sentence?" Tomasello (1994) accepts that Savage-Rumbaugh et al. (1993) have made a strong case for the claim that Kanzi can understand certain kinds of spoken English sentences. However, he maintains that, for various reasons, a *better explanation* of Kanzi's responses to test sentences would be to say that he achieves something short of the full understanding that we humans eventually develop. He argues that Kanzi does not seem able to make sense of sentences including recursive structures and, even more significantly, does not "have control over . . . the grammatical category of the verb" (384).

> He has something like a grammatical category of noun allowing him to comprehend (and perhaps produce) newly learned object labels in the same sentence frames in which previously learned object labels have been used. He has yet to form any class of verbs or subclass thereof, however, that would license word order or other grammatical generalizations across events. (384)

It is clear that underlying Tomasello's argument is the premise that these are things we humans *do* and that they make up an important, ineliminable component of what understanding a sentence consists in for us. Therefore, if Kanzi doesn't appear to grasp recursive structures or construct grammatical generalizations, then what he is doing is *better explained as something other than what we do* when we understand a sentence: quunderstanding.

I mention this example not because Tomasello (1994) is one of the more trenchant critiques of Savage-Rumbaugh's metalinguistic claims about Kanzi; for, on the contrary, he concurs with many of her most important findings. Instead, its function here is to indicate the slippery rhetorical slope down which Tomasello's criticism takes the first hesitant steps and which linguistic critics have turned into something like an Olympic bobsled run. Tomasello indicates just two kinds of behavioral responses that, he feels, Kanzi ought to be able to produce if the behavioral responses that he *does* produce (e.g., putting some grapes in the swimming pool) are to be best explained by claiming that "he understands the sentence." For when we humans understand a sentence, we *can* produce the former two responses.

But why should we stop at two? Any human who understands the request "Would you put some grapes in the swimming pool?" can do a lot more than simply respond to it by putting some grapes in the swimming pool. He can point to the grapes and to the swimming pool. He can respond appropriately to "Would you put a grape in the swimming pool?" and "Would you please *not* put any grapes in the swimming pool?" and "Would you put the grapes that are in the box in the bottom of the refrigerator into the swimming pool?" He can explain what "swimming pool" means and determine whether the original request means the same

thing as "Go to the swimming pool and put in some grapes." He can probably tell you how many words are in that request and maybe even something about how they each relate to the others in the sentence. And so on.

So, if these are the kinds of things that any human who understands that sentence can do, doesn't it make sense for a method of evaluation to require that an ape be able to do those things too: that is, if that method is to evaluate as justified the claim "He understands the sentence"? And, if the ape cannot do all these things, would it not appear that the claim that he understands is an inappropriate explanation of his reponse and that it would be better explained by something like "quunderstanding"? For example, it is in this vein that Tomasello argues that instead of applying generalized grammatical categories—as we humans apparently do when we understand a sentence—a better explanation of what Kanzi does is something that falls short of that. Naturally, Tomasello doesn't use the expression "quunderstanding." Instead, he suggests that what he calls the "the Verb Island hypothesis" is what Kanzi applies when he hears a verb in a sentence, instead of applying the generalized grammatical categories that we adult humans apply when we understand (Tomasello 1994, 383). Seeing how easily this game is played, linguist critics have upped the ante a great deal higher.

In other words, there is nothing to prevent the linguistic critic from availing herself of the possibilities inherent in the operational approach. She can go so far as to demand that *if it is to be justified to affirm of an ape any* ONE *of the metalinguistic claims that are typically affirmed of humans*, then it must also be justified to affirm ALL, or at least all those which this or that linguistic theory represents as implicationally related. To see how much sense this makes within linguistics, one need only consider the perspectives of the two dominent theoretical schools of this century. For instance, according to Saussure's structuralist linguistics, the meaning of any sign is structurally defined by its relation to every other sign in the language. So it would not be possible to understand one word, or for that matter a single sentence, without knowing the whole language.

Or, if we turn to Noam Chomsky's school of generative linguistics, we find that—at least according to one its most prominent members—to understand a given sentence one's brain has first to "parse" it (Pinker 1994, 196). And this can only be done if one possesses an internalized generative grammar, with all its attendant principles, parameters, rules, lexical and phrasal categories, dictionary entries, cases, and traces, as well as the mental parsing program for teasing out all these and other structural features in the sentence's grammatical and semantic organization (196–201). Can Kanzi do all this? Does he possess all this mental paraphernalia? If not then, according to generative theory, *he cannot possibly understand a sentence*. So doesn't it make sense, if we want a rigorous means of determining whether Kanzi really understands any sentences, to require that he be *shown* to do and possess each and every one of the things that are apparently *necessary* to the ability to understand a sentence (and all of which, the theory tells us, we humans do and possess)? For, if any one of them is absent, then the best explanation of Kanzi's response to the sentence cannot really be that he understands it, but rather that the communicational state that actually obtains is something like quunderstanding.

Thus, a linguist who—for one reason or another—is troubled by Savage-Rumbaugh's claim that Kanzi understands the request to put some grapes in the swimming pool and who wants to formulate an operational method of evaluation that reflects this worry, can insist that that claim ought to be evaluated as the "best" explanation of Kanzi's response *only if* it can be shown that it is justified to attribute to Kanzi more or less all the communicational abilities that this or that theory of language attributes to an adult human. For we human speakers of English, who easily understand such requests, have countless other communicational abilities as well; and, according to most of the dominant linguistic theories of the age, these abilities all form a complex implicational web. And these theories, and the implicational links they draw, have deep roots in the commonsense picture of communication. After all, can someone really be said to understand a sentence if he cannot understand each of its words? But can he really understand a word if he cannot *say* what it means? Can he understand grammatical relations if he doesn't understand the words thus related? And how can he grasp any of the meanings conveyed in human language if he doesn't understand any of the words, and so any of the sentences, and so any of its grammar?

Adopting an operationalist method of evaluating metalinguistic claims has the advantage of avoiding a clash with commonsense over what such claims are conceived to be about. But it has the disadvantage of making it methodologically plausible for the critic of primate research to demand that, for a metalinguistic claim about an ape to be evaluated as justified, *the ape must be proven to be a human.*

Metalanguage as Cultural Technique

To understand a sentence means to understand a language. To understand a language means to be master of a technique.

Wittgenstein, *Philosophical Investigations*, section 199

This chapter began by arguing that no progress will be made in answering metalinguistic questions like 1 to 4, repeated here, until there is agreement in the scientific community on common methods by which hypothetical answers to such questions are to be evaluated.

1. Can a laboratory-reared ape, such as Kanzi, really understand what a spoken English sentence means?
2. Do the signs and lexigrams that some apes have learned to produce really mean or refer to anything?
3. Are any of these apes, when producing or responding to communicational behavior, really following (even simple) linguistic rules?
4. Does any such ape know what it is doing when it produces or responds to language? That is, does it really understand, as we do, that language is for communicating thoughts and intentions to others, for speaking truly (and sometimes falsely) of the world, and for attaining particular communicational goals?

As I have shown, any method of evaluating a metalinguistic claim about an ape must satisfy two *logical* requirements. First, scientists must use the same method of evaluation if a comparison between their evaluations is to make any sense. Second, that method must be applied equally to both apes and humans; for what we want to know is whether an ape possesses any of the communicational abilities *that we know we humans possess*. Consequently, any metalinguistic claim about an ape must be evaluated by the same method as is applied to a comparable claim about a human—otherwise, the claims are *not* comparable. If this Equality Requirement is not satisfied, then comparing a claim commonly made about a human with one asserted about an ape will not be a matter of comparing "like with like." Instead, it would be like comparing my evaluation of Bobby's behavior in the swimming pool with your evaluation of Henry's behavior, when each of us is using a different method of evaluation. Such a comparison can only produce nonsense. And the same is true if the Commonality Requirement is not satisfied. If a generative linguist and a behaviorist psychologist each assert something about Kanzi's communicational abilities, it can only make sense to compare their assertions if each assertion is "measured" by the same method of evaluation.

In addition to these two logical requirements, further *rhetorical* requirements are typically imposed on the task of formulating a method for evaluating a claim about an ape's communicational abilities. These rhetorical requirements are derived from what Wittgenstein calls the *raw material*: in other words, what we are commonsensically *inclined to say* in discourse about communicational behavior and abilities. For it is these discursive inclinations—which are illustrated in what I have been calling the commonsense picture of communication—that lead us, by a fairly direct route, to the epistemological conception of what a method of metalinguistic evaluation *must* do and, equally significantly, to the conviction that that conception is the *only* way to make sense of that task.

Of course, the epistemological conception is far from being a controversial way of looking at the task of evaluating metalinguistic or, for that matter, cognitive claims. The modern scientific study of language is founded on it. The cognitive theories examined by Shanker in the previous chapter *all* incorporate an epistemological conception. And it is hardly surprising, for the steps by which one gets from "commonsense" to the epistemological conception are all patently obvious. After all, it is surely nothing more than commonsense to expect that a method of evaluation will require any claim to establish that *that which it claims is in fact true*. (Surely we expect such a method only to evaluate the claim as justified if it is really true?) Nor is it a strain on commonsense to interpret that requirement as demanding that the state of affairs that must obtain, if the claim is true, actually *be shown to obtain*. (Again, we must surely expect that if a metalinguistic claim is to be judged true, then it must be shown that that which it *says* is a fact—e.g., Kanzi understands this sentence, this keyboard symbol refers to that toy, Kanzi interprets sentences using the Verb Island hypothesis, etc.—*actually* is *a fact*!) Finally, wouldn't it be absurd to object to interpreting this last demand in terms of a rule prescribing that *enough evidence, of the right kind*, be provided to establish that that state of affairs does in fact obtain? And this is, after all, nothing more and nothing less than what the epistemological conception requires.

At the same time, one should keep in mind that it is perfectly understandable that we should have these commonsense inclinations—the *raw material* of the rhetorical patterns here analyzed. For they are not arbitrary, or even reasoned, options that—in order to avoid their methodological consequences—we could just as easily free ourselves of. On the contrary, their roots are deeply embedded in the habitual soil of our everyday lives: in our routine, intuitive ways of interacting with each other and making sense of those interactions, both to ourselves and to others (see Taylor 1997, chap. 1). Were we to abandon these commonsense ways of talking and thinking about our communicational acts and abilities, about the relationship between these acts and abilities and the physical, social, and cultural world around us, and—at a further reflexive level—about these very ways of talking and thinking, we would lose all that we know ordinary life to be. We are "inclined" to the commonsense picture of communication—and so also to an epistemological conception of metalinguistic evaluation—because we feel unable to imagine any other possibility.

However, while on the one hand, we are powerfully inclined to the epistemological conception of what a method of metalinguistic (or cognitive) evaluation must do, on the other hand, *the central argument of this book is that it is the epistemological conception of that task that bears primary responsibility for the frustrating inability of the scientific community to come up with a common evaluative method*. And without a common method of metalinguistic evaluation it will be impossible to make real progress on any questions about the communicational (or cognitive) abilities of apes (and other nonhuman animals).

I have presented an analysis of the two main types of rhetorical strategy being used today by those who are trying to develop such a method: reductivism and operationalism. These analyses were intended to present paradigmatic illustrations of the two contrasting types of rhetorical possibilities made available by an epistemological conception of metalinguistic evaluation. However, as Stuart Shanker shows in his analysis of the historical and contemporary patterns of thought in cognitive science, most methods of metalinguistic and cognitive evaluation are supported by arguments that *combine* both these strategies. For example, in the published texts of most animal language researchers, one will find both operationalist and reductivist arguments employed to motivate the author's methodological claims; and which of these is employed at any one moment seems to be a function not of rhetorical consistency but of the characteristics of the particular metalinguistic issue at hand. To the extent that a method of evaluation employs a reductivist strategy, it solves the problem of Epistemic Conviction by reducing to observable behavior the state of affairs that must obtain if the metalinguistic claim is to be evaluated as true. Still, because it can tell us nothing about that which commonsense inclines us to call understanding, meaning, referring, and so on, its strategic "solution" to that methodological problem amounts only to a rhetorical illusion. To take the result of applying such a method as providing answers to the questions motivating scientific research—for example, whether, like us, apes can understand, refer, mean, and so on—would amount to illogical nonsense.

Operationalism, on the other hand, does not clash with commonsense in this way. Instead, by transforming the problem of Epistemic Conviction from an evi-

dential to an explanatory matter, an operationalist strategy imposes on any method of metalinguistic evaluation the requirement to prove that the explanatory theory justifying its evaluations is the "best" theory available. The search for sufficient evidence is thus recast as a quest for "the best theory" of communicational abilities. The rhetorical consequence is that a specific question about an ape's communicational ability—asking, for example, whether Kanzi understands or Austin refers or Panbanisha means what she says—is a matter to be addressed no longer by practices of empirical observation but rather within the language games of theoretical argument. And to the extent that a given explanatory theory of communicational abilities represents any one such ability as implicationally related to any others, that theory requires a method that evaluates the attribution of that ability to an ape to establish that the ape in fact possesses them *all*.

The conclusion of the analyses given in the last two sections should therefore be clear: *Each of these rhetorical strategies is a street leading to a methodological cul-de-sac*. Yet what keeps luring us down these same dead end streets, again and again, is the epistemological conception. For reductivism and operationalism are strategies designed to address particular *kinds* of methodological problems, and these kinds of problems only arise under an epistemological conception of the task of metalinguistic evaluation. The epistemological conception represents understanding a sentence, referring to someone, performing a particular speech act, knowing a language, and so on, as states of affairs: those that must obtain if the claims about them are true. And it represents the behavior that we observe as *evidence* for or against such claims. Given these conceptual presuppositions, it is only natural that we expect a method for evaluating metalinguistic claims to determine *if that evidence is sufficient to establish that those states of affairs do in fact obtain*. Reductivism and operationalism are two strategies specifically designed to respond to this (rhetorically generated) expectation.

And yet again—because it cannot be repeated too often—the rhetorical roots of the epistemological conception run deep into our "raw," intuitive inclinations in everyday, practical metalinguistic discourse and, indeed, into the foundational role which that discourse plays in the taken-for-granted ways in which we participate in and make sense of even the most routine events in everyday life. But if this is true, then what hope can we have to break the conceptual spell of the epistemological conception? As the analysis of its rhetorical consequences shows, *break it we must*. But how? How could we possibly keep ourselves from succumbing to its allure? And how could we learn to resist the temptation—when we consider questions like 1 to 4 stated earlier or like those discussed by Shanker in chapter 2—to walk headlong yet again into the methodological dead end of giving those questions an epistemological interpretation? The experience of the last 350 years of Western thinking on the cognitive and communicational issues will hardly give one any grounds for optimism.

Nevertheless, at least in principle, the answer to our dilemma is obvious. We need to see metalinguistic questions differently; we need to respond to them with different inclinations, different compulsions. For the source of our dilemma, the *raw material*, is a compulsion: a rhetorical compulsion. When, as scientists of communication and cognition, we read Savage-Rumbaugh's description of an

occasion when Kanzi understood something she said, we feel *compelled* to reply "Yes, but does he *really*?" And, taking a confident step into the cul-de-sac, we feel compelled to see our skeptical question as raising epistemological issues and, so, to address it accordingly. Yet, while it is essential that we acknowledge this compulsion, we do not *have to* give in to it. We do not *have to* respond to this commonsense compulsion to impose an epistemological interpretation on the kind of metalinguistic description that Savage-Rumbaugh provides in chapter 1. Nothing *forces* us down this road. On the contrary, some compulsions, as we all know, have to be resisted; and most of us are more or less good at doing so. There are well-known methods designed to help us do so. And, equally important, we all already have plenty of experience responding to metalinguistic claims in ways that do *not* treat them as raising epistemological matters: that is, when those claims are about our fellow humans. Of course, we may occasionally reply to such a claim with "Yes, but does s/he *really*?" But, as I have argued, such a response is not and, significantly, *could not be* the norm. And going one step further, by interpreting and treating that response epistemologically, would be an absurdity.

At the very least, reflecting on our everyday experiences of metalinguistic claims should help us to appreciate the following. *If*—against the rhetorical grain of these "commonsense" inclinations—someone *does* feel inclined, as Savage-Rumbaugh and others undoubtedly do, to speak of an ape like Kanzi, in certain circumstances, using the same metalinguistic terms as those that we ordinarily employ in speaking of a fellow human in similar circumstances, then it would make little sense to respond to (treat, evaluate, criticize) the resultant metalinguistic claim as if it existed *sui generis*. For, as Savage-Rumbaugh's narratives make palpably clear—and as our experiences of everyday understanding-claims should confirm—such a claim exists not as an autonomous, empirically based hypothesis, but as a functional component of our lives with the ape or humans concerned. As an instance of practical metalinguistic discourse, it is integrated within our form of life, which is in turn made up of routine, interactional techniques by which we cooperate with the apes or humans concerned, contend with them, try to bend them to our will, depend on their reactions to accomplish joint interactional tasks, express our pleasure or displeasure at their actions, treat them as moral agents, and so on. That is, speaking of our neighbor or of Kanzi in metalinguistic (or, for that matter, cognitive) terms is consequential for how we can "live with" them in these sorts of ways; just as how we "live with" them has consequences for our inclination to speak of them in certain ways (see Smith 1988, ch. 7). Speaking of them thus is a functional component of the interactional techniques that constitute our form of life.

However, when we take one such metalinguistic (or cognitive) remark out of this practical context-of-occurrence and evaluate it epistemologically—asking *what* it is true of and whether *that state of affairs obtains*—we treat that remark as if it existed *sui generis*: as if it had an identity (in this case, an epistemological identity) that is independent of that context-of-occurrence. In so doing, we extract it from the cultural soil of life, from which it draws its nourishment and to whose ecology it makes an essential contribution. No wonder that the result of such an extraction is to effect an immediate and paralyzing halt in the growth of knowledge and understanding.

Looking at Savage-Rumbaugh's metalinguistic claims from this perspective may give us the means to mount some resistance against our rhetorical compulsion to conceive, and so treat them, epistemologically. For it would be a non sequitur to extract one of her claims from the natural, interactional context of which it forms an integral part and treat it instead as if it were a "primitive" empirical hypothesis to which an epistemologically conceived method of evaluation should be applied. While this might satisfy the kind of rhetorical compulsion discussed above, it would also lead to at least two unwelcome effects. First, it would take the first step down the road into the kind of rhetorical cul-de-sacs mapped out above. But more fundamentally, it would treat Savage-Rumbaugh's claim as if it were something which it is not. In other words, if in order to subject it to an epistemologically conceived evaluation, one extracted her claim from the interactional techniques of which it is an integral part, the effect would be to change the identity of the claim. The result would not be a more rigorous or more objective evaluation of that claim; *it would be the evaluation of a different claim.* Analogously, if you evaluate my assertion "Bobby's swimming pool behavior is very good" by reference not to my own method of evaluation but to yours, the claim that you evaluate—although misleadingly formulated with the same expressions—will not be that which I had asserted. That is to say, you will fail to evaluate my claim.

This argument has a parallel in discussions of attributions of *value*. We can imagine a set of circumstances in which attributing a value of twenty thousand dollars to a chair—that is, saying something like "This is worth twenty thousand dollars"—fits perfectly. In order to make better sense of this imaginary scene we would have to fill it out with such details as the age of the chair, its period style, its maker, what current opinion in the art world says about the chair or ones like it, who is selling it, who is considering buying it, their financial circumstances, where the discussion is taking place, how much other interest in the chair has been expressed, how much other chairs of its type have recently sold for, how many others of its type are known to exist, and so on. The attribution of a value of twenty thousand dollars *can* only be seen to make sense if it is taken as "embedded" in a context characterized by details of this and similar kinds. As such, the identity of that attribution—what is actually being said—is inseparable from its function *as an integrated component of* that context (see Harris 1995, ch. 2).

But what sense could we make of the attribution if we extracted it from that context and treated it instead as having a *sui generis* identity and validity? In other words, if we completely ignore all the kinds of details just mentioned, how can we possibly evaluate the justification of such an attribution of value to the chair? Or of *any* attribution of value? Would it not be absurd to think that value inheres in a material object completely independently of all such contextual features and that, therefore, to justify an attibution of value one must demonstrate that the state of affairs in which that inherent value consists must be shown to obtain? (To see this absurdity, one need only imagine a Samuel Beckett play in which there is a nuclear holocaust, leaving nothing in the world except this chair and the two people dickering over its price. In what sense could they even be conceived as talking about the same thing as the buyer and seller just evoked?) An epistemological method of evaluating attributions of value would clearly be absurd (which is not to say that it hasn't frequently been proposed or that it will not be again). Why, in the analogy that Smith (1988) draws attention to, should we not see the same absurdity in giving a similarly *sui generis* treatment to a metalinguistic claim?

An appropriate method of evaluating the actual claims made by Savage-Rumbaugh must be one that takes into account—to the extent possible—the integration of those metalinguistic and cognitive claims into particular kinds of interactional techniques and contexts: particular kinds of "language games" and the forms of life to which they contribute. It is for this reason that this book begins with Savage-Rumbaugh's extended narrative of Kanzi's upbringing as well as many interactional episodes from her life with Kanzi. For the claims she makes about Kanzi's behavior and abilities must be seen—if we are to make sense of them—as emergent properties of the lived story that is partially recounted in that narrative: not as *sui generis* propositional atoms. And it is as the former rather than the latter that those statements must be evaluated, if their sense is to be grasped and assessed accordingly. One way of putting this might be to say that coming to an appropriate evaluation of those claims—learning how to evaluate those claims sensibly—involves coming to know Kanzi. The appropriate method of evaluation is one that becomes, to the extent possible, a part of that process.

Of course, an argument like this *might* be taken to imply the conclusion that only Savage-Rumbaugh (and a few of her colleagues) can really know if Kanzi understands what she says to him (or whether his words refer, or whether he knows what language is for, etc.). And this reasoning might suggest that the foundations of one of her metalinguistic claims about Kanzi are necessarily different from those that could support a superficially similar claim that I or anyone else in the scientific community might make about Kanzi—or, for that matter, about a fellow human being. For after all, while I have observed Kanzi in person and on tape for many hours, this is nothing compared to the years that Savage-Rumbaugh has spent living in close company and interacting with Kanzi. As the narrative in chapter 1 shows, they are accustomed to participating together in using a great number of interactional techniques; they share, in this respect, a common form of life. Kanzi and I do not. In this case it might be concluded that, if the foundations for her claims about Kanzi's communicational abilities inhere in these shared techniques and common form of life, then any metalinguistic claim that *I* might make about Kanzi could not possibly have the same foundations. The reasons why *she* is justified in speaking of Kanzi as understanding something she said, it would seem, cannot be *my* reasons. And the same would go, of course, for the reasons of the rest of the members of the scientific community.

However, how is this situation different from those in which we evaluate claims made about the communicational behavior and abilities of many of our fellow humans? Imagine, for instance, that you told me that a man I have never met—call him John—had understood a particular remark that you made? Here, also, I have no firsthand experience on the basis of which to evaluate your claim. Imagine also that, for some reason, I am prevented from obtaining any: say, John recently died. Of course, I would typically be inclined to take the accuracy of your opinion for granted. That would only be commonsense. But we are ruling that out here for the sake of the comparison with Savage-Rumbaugh and Kanzi, where

commonsense inclines us in a different direction. So what would I do? I would doubtless listen very closely to your description of John's response to what you had said; I would consider how well you had known him and how often and how successfully you had interacted with him. I would consider whether the way that you explained the justification for your claim matched my own expectations. And so on. In other words, I would do the best I could with the methods available: that is, with the practical methods by which we ordinarily determine if someone understands what we or someone else says. But the point is that it would be illogical to abandon those practical methods and substitute another in their place, simply because there were obstacles to their normal application. If the problem is to get more of something that we are lacking—for example, the kind of firsthand experience just described—it would be absurd to think that the way that problem must be solved is by obtaining *something else in its place*.

It is clear that no one except Savage-Rumbaugh herself (and perhaps a few of her colleagues) can ever have had her firsthand experience of interacting with Kanzi as he grew up: the developing form of life in which her claims about his communicational abilities are founded. But the solution to the *practical* problem that this raises for the task of evaluating those claims is not to commit the *logical* non sequitur of shifting to another, theoretically conceived method of evaluation. Instead, it is the record of those experiences that we in the scientific community should examine if we want to see the justification for those claims. We should study her narrative descriptions, as well as those of her colleagues and of others who have observed her interacting with Kanzi. If possible, we should attempt to observe their interactions ourselves, or at least view the many videotapes of those interactions that are currently available. By means like these we should gradually be able to make better sense of the justification for her claims about Kanzi's abilities. The obstacles that such a method might encounter would be of a practical nature and would be more or less surmountable depending on the equally practical circumstances. But, in contrast, the rhetorical obstacles that an epistemologically conceived method of evaluation would encounter, as I have shown, are insurmountable *in principle*.

These methodological recommendations might be thought to amount to a conclusion that many in the scientific community would perceive as disappointing: that is, the conclusion that unlike the claims made in many other scientific fields, metalinguistic and cognitive claims about apes and other nonhuman animals cannot be evaluated according to the scientific method. Of course, whether such a conclusion is appropriate would obviously depend on what one's conception is of the scientific method. All the same, it remains that *if* this is the appropriate conclusion to draw for metalinguistic claims about apes and other nonhuman animals, then it cannot be any less appropriate for metalinguistic claims about *humans*. And why should that be so disturbing? Would such a conclusion mean that we would be any less sure that we typically understand what others say to us, that they typically understand what we say to them, that we speak the English language, or that the expression "The White House" refers to a particular building in Washington, D.C.? Would the fact that these claims could not be subjected to the scientific method mean that *we could not therefore be sure whether they were true*? Would this mean that it is possible that everyone is wrong and that "The White House" really refers to some other building?

Scientific method or no scientific method, if the comparison of evaluations is to make any sense, logic demands equality of evaluative method. So, if this familiar kind of practical certainty is not—*in principle*—enough for our ordinary metalinguistic claims about each other, then nor is it in principle enough for our claims about Kanzi. But, on the other hand, if it *is* sufficient for our claims about each other, then we can only conclude that it is also sufficient for our claims about Kanzi. The practical matter, then, is whether we can attain that degree of certainty in making a metalinguistic claim about an ape like Kanzi. But that practical matter cannot be wished away by changing its conceptual definition; *it must be addressed with practical methods*.

Progress in scientific research on the cognitive and communicative abilities of apes is stalled because we misconceive the role that cognitive and communicational claims about our fellow humans play in our everyday, cultural lives. The rhetorical inclinations of "commonsense" blind us to the practical foundation of such claims: that is, *to their functional integration into the interactional techniques that make up our cultural forms of life*. Instead, we are led to the assumption that those claims require an epistemological foundation. Furthermore, because commonsense also tells us that we humans ordinarily understand each other, refer to objects, have beliefs, make reasoned choices, and so on, we take it for granted that typically those claims do in fact have that foundation when we affirm them of our fellow humans. By means of this conceptual illusion, we are thereby led to place an impossible rhetorical requirement on ape research. We demand that, when such cognitive and metalinguistic claims are applied to apes, they also be epistemologically grounded.

In her article "Eating Meat and Eating People," the philosopher Cora Diamond discusses the closely related issue of arguments against the practice of eating animals. She shows that those animal-rights philosophers who attempt to found such arguments on "reasons which are reasons for anyone" are making a rhetorical mistake. For such a strategy is based on a misconception of our own inclination not to eat *our fellow humans*: as if that inclination were itself founded in rational argument and that therefore the same must be established for the vegetarian's inclination not to eat animals. "The moral expectations of other human beings demand something of me as other than an animal; and we do something like imaginatively read into animals something like such expectations when we think of vegetarianism as enabling us to meet a cow's eyes. There is nothing wrong with that; there *is* something wrong with trying to keep that response and destroy its foundations" (Diamond 1991, 333). Analogously, we might say that the moral expectations of our fellow humans demand that, all things being equal, we typically treat them as understanding what we say to them. We do something like imaginatively read into an ape such expectations when we think that, by treating it as understanding what we say, we make it possible to interact with it in a more productive, coordinated fashion. There is nothing wrong with that; there is something wrong with trying to keep, or to reject, that response by replacing its foundations with others that are epistemologically conceived. Another way of saying this, and one of the main points we are trying to convey in this book, is that the

following equivalence runs both ways: "[O]ur *hearing* the moral appeal of an animal is our hearing it speak—as it were—the language of our fellow human beings" (333–34).

Perhaps the conclusion that we must come to is that the rhetorical obstacle to progress in gaining scientific knowledge about the cognitive and communicational abilities of apes is only a side effect of the other, more daunting, practical obstacles that prevent us from living more harmoniously in their company and so from participating in the kind of fine-grained interactional techniques that would go into sharing with them a form of cultural life. Sue Savage-Rumbaugh has had astonishing success in overcoming many of those practical obstacles; and her descriptions of the cognitive and communicational abilities of Kanzi are some of the more valuable fruits of that success. But the more general, methodological point that we must take away from her work also promises much. We must learn to resist the illusory conception of those practical obstacles as having an epistemological foundation and, therefore, as requiring epistemologically conceived solutions. In so doing, we will facilitate the achievement of real progress in research on the cognitive and communicational abilities of apes. And we will gain the added benefit of eliminating that illusory conception from the armory of rhetorical weapons that are regularly employed in defending the refusal to hear the moral appeal of any other species but our own.