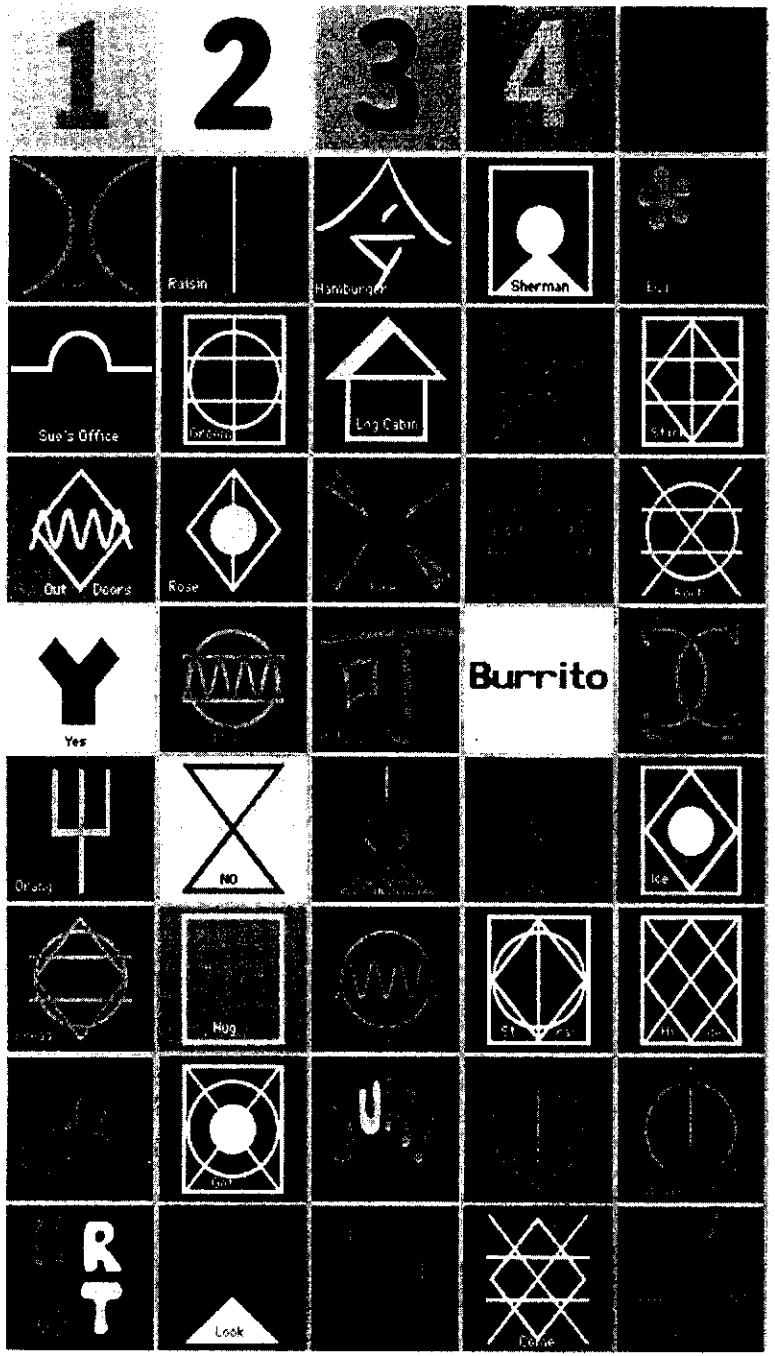

Section of the keyboard showing several lexigram symbols.

Matata seemed to be of the opinion that a youngster Kanzi's age should not be held responsible for the consequences of his actions—consequences he could not yet understand. She also realized that at times Kanzi became upset or distressed for foolish reasons, and on such occasions she had to determine for herself whether there was sufficient cause to be angry. For example, one problem Kanzi repeatedly encountered was getting his hands caught as he put them in places where they did not belong. When this happened, he would panic and try to yank himself free, only making the predicament worse. For example, one day he inspected a chain I was wearing around my neck. While exploring this object, as bonobo infants want to do with every new thing they encounter, Kanzi abruptly twisted it and caught his hand in the resulting loop. When he tried to pull his hand out, he found that he could not. Rather than wait for me to help him get it out, he started screaming at me and tried to scratch and bite my face as though he believed that somehow I was holding onto him on purpose with my necklace and had decided not to let go. He pulled so hard that I could not speak, and I feared that I would soon choke if I did not get him to calm down so that I could free his hand.

While Matata looked at me with great alarm in response to Kanzi's screams, I gesticulated vigorously at my neck to illustrate Kanzi's predicament and that I was not purposefully trying to make him scream. Matata was able to see and understand the situation, so she did not attack me, even though Kanzi was trying to bite me and was calling for her support. Finally, I was able to free his hand by breaking the necklace, but even then he continued to bark at me and remained angry for the rest of the day. Matata tried to console him and show him that I was her friend by grooming me, but Kanzi did not share her opinion and continued to bark and slap at me for the rest of the day every time I reached out to him. Similar events occurred when Kanzi got his hand caught in the hammock, in a coke can, and in the long hair of another person working with him. Each time, Matata evaluated the situation and determined that even though Kanzi thought we were attempting to hurt him, this was not in fact the case.

After two years of effort and more than thirty-thousand trials with the lexigrams "banana," "juice," "raisin," "apple," "pecan," and "orange," Matata's symbol vocabulary skills remained disappointing. Although she had learned to ask for and name each food correctly, she could not select a picture of the food if I pointed to its symbol. She also had difficulty "listening." When I used the keyboard to ask her to give me a specific food, she seemed puzzled. Perhaps she thought I should just take any food that I wanted. Such deficits suggested that she had not yet grasped the representational aspects of these symbols.

All common chimpanzees who had learned to use symbols were considerably more accomplished than Matata. Not only could Sherman and Austin select pictures that corresponded to symbols, they watched when others touched symbols, and they responded appropriately. They used symbols to tell each other about hidden foods and tools, and they sorted symbol-words into categories such as foods, tools, and drinks. They even learned to draw some of their own symbols (see Savage-Rumbaugh 1986). Both Lana and Ai, a chimpanzee raised in Japan and

especially intrigued by watching Sherman and Austin play chase with one another. They frequently used the handclapping chase gesture as they did so, and Kanzi seemed to want to join in; however, these large adolescent males were having such a great time with each other that they completely ignored the young bonobo male on the other side of the wire. Kanzi sat and looked at them wistfully. The very next day, Kelly saw Kanzi attempting to make the handclapping gesture. As she described it:

> Learning to clap his hands was quite a feat for Kanzi. I remember one Saturday morning sitting in the cage with both Kanzi and Matata when Kanzi was about a year and a half old. Matata and I were in her nest grooming, while Kanzi sat about ten feet away from us. I could see he was concentrating on something very intently, yet could not see exactly what he was doing since his back was turned. When he later turned to face me it appeared as if he was trying to transfer something from one hand to the other. Then I realized he had nothing in his hands and was simply trying to make his two hands meet. He held one hand close to his body with the palm up while holding his other hand high over his head with the palm down. Slowly and carefully, he tried to bring both hands towards each other, working on this task with an expression of utmost concentration on his face. However, he could not quite coordinate both hands at the same time and ended up clapping only air instead of his hands! It was really funny to watch him do this because he was so serious about it, yet his hands kept missing each other! But he practiced very diligently on this new task, sometimes up to twenty or thirty minutes at a stretch. By the end of the day he had improved to the point where he occasionally was able to get both hands to make contact, but not on every attempt. He continued to practice on and off all throughout the day Sunday. By the time I left Sunday evening, I saw that his perseverance had paid off as Kanzi was clapping his hands with regular success.

Travels in the Forest

After chasing with Austin, Kanzi grew hungry. He climbed onto Jeannine's shoulders and gestured toward the woods. Jeannine held up the keyboard, and Kanzi said "juice." Jeannine commented that juice was found at the Treehouse, then she sat Kanzi down and placed five pictures from her bag in front of him to see if he knew where he was going. Kanzi quickly selected the Treehouse photo and climbed back onto Jeannine's shoulders while carrying the Treehouse picture with him. As Jeannine and I walked to the Treehouse, we commented at the keyboard on things that we saw along the way, such as the turtle that crossed our path, the ball that Kanzi had left at the trailer the previous day, and the car that passed us on the road just before we turned into the woods. Kanzi quietly noted everything we said but continued to hold onto his Treehouse picture as we walked. At one point, he gestured toward me, indicating that he would like to ride on my shoulders a while, so I obliged by standing close to Jeannine and letting him climb onto me.

Just before we reached the Treehouse, I felt Kanzi's body begin to stiffen, and I noticed that the hair on his legs, which was all I could see of him when he was astride my shoulders, was beginning to become erect. Kanzi made a soft "Whuh" sound and gestured to the side of the trail. There, a short distance from my foot, was coiled a very large snake. I screamed and jumped back several feet, almost falling as Kanzi grabbed hold of my head to hang on. Kanzi's keen eyes had enabled him to give a last-minute warning that had come just in time. I returned Kanzi to Jeannine, found a very long, sturdy stick, and proceeded to prod the snake until it moved into the bushes and disappeared. As soon as I moved toward the snake with the stick, Kanzi produced extremely loud "Waaa" calls, as though to warn me that what I was about to do was dangerous. Each time I actually struck the snake with the stick, Kanzi felt it necessary to "Waaa" yet again. Pretty soon Jeannine and I were "Waaaing" ourselves. "Waaa" seemed to be a pretty good word for "snake," and when it was uttered with the gusto that Kanzi mustered, the ferocity of the sound itself was almost effective enough to scare the snake away. I soon became so accustomed to giving "Waaa" barks to alert Kanzi whenever I saw a snake in the woods that I began to find myself "Waaaing" even when I was walking home alone and came across a snake.

Having cleared the snake from the trail, Jeannine, Kanzi, and I proceeded on to the Treehouse. As soon as we arrived, Kanzi leapt from my shoulders and rushed to the cooler. Each cooler was tied with a strap and held tight with a plastic squeeze lock. Kanzi was fascinated by these locks and wanted to learn how to open and close them on his own, so he tried to open every cooler by himself, whether he was interested in eating the food or not. I held the keyboard up to Kanzi and asked him to stop trying to open the cooler and answer a question for me if he could: "What is in the cooler?" Did Kanzi recall the foods typically found in the Treehouse cooler even though he could not see them? Kanzi quickly answered "juice-banana," then shoved the keyboard aside and again set to work on the lock.

Kanzi's answer was correct, and although simple for him, it reflected the astounding mental mapping of the forest sites he had achieved in a relatively short period of time. Within the first five months after Matata left, Kanzi had come to recognize sixteen different locations in the woods, and he knew the foods that were typically found at each location. He could select a photograph of the location, or of the food, to indicate a desire to travel to any of the different places. For some places, such as the A-frame, he had already learned the lexigram symbol as well. When he asked to go to a certain place by choosing a picture of that location from a group of photos, he always knew the kind of food that would be in the cooler even before it was opened, and if you asked him to tell you, he was happy to do so, either by selecting a photo or by pointing to the name of that food on the keyboard.

Kanzi seemed to have a map of the entire forest in his head and could easily travel to any spot he desired. When visitors came to the lab, he took great delight in showing off his forest by climbing onto their shoulders and announcing a list of places to visit. At first, we would tell them how to get to where Kanzi wished to go, since they knew nothing about the forest. We soon found that Kanzi was even better at this than we were and that he could guide them directly to any location he had selected, either by gesturing in the correct direction every time they came to a fork in the trail or by hopping down from their shoulders, taking them by the hand, and leading them down the proper trail. In fact, Kanzi mastered the forest more quickly than most of the lab workers who were his companions on these forest rambles. Some of them still carried maps in their backpacks and

What is clear from these reports is that Savage-Rumbaugh and her collaborators unhesitatingly responded to Kanzi's behavior in these situations as manifesting his understanding of the utterances addressed to him. Moreover, their spontaneous responses do not appear to have been defeated by the subsequent development of the interactions. Kanzi did not go on to reveal that he really hadn't understood the request to give Panbanisha an onion (say, by continuing to hold on to the onions and waving them around in front of everybody present); or that he had not really comprehended the clue about the hidden surprise; or that he only *seemed* to grasp what was being said about going to the trailer and making water balloons (for example, by revealing that *whenever* he heard the word "water" he would run to the trailer and hold a balloon under the faucet). Savage-Rumbaugh therefore goes on to assert that, at the age when these events occurred, "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." Yet only a few lines later she remarks that this assertion did not meet with general acceptance in the scientific community: "[T]he 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."

The scientific community, in other words, was not (and still is not) agreed that Kanzi really had understood the sentences spoken to him in the episodes just reported, or in the many other episodes like them. According to many of "the critics," even though Kanzi's behavior *seemed* to manifest his understanding to those who were interacting with him at the time, his behavioral responses should instead be explained not as instances of his understanding the semantic content of the sentences, but rather as the effect of such phenomena as contextual information, inadvertent cuing, prior training, nonlinguistic associations, or even luck (and good guesswork). He may have *acted as if* he understood the sentences, but he did not *really* understand them. The critics argued, in other words, that Kanzi's behavior only gave the illusion that he had understood what the sentences meant, just like the behavior of a pet dog gives the illusion that she understands the sentence "Go get your leash and bring it here if you want to go out for a walk."

To respond to such skepticism, Savage-Rumbaugh designed and, over a period of nine months, carried out a formal program of controlled laboratory tests. (These are discussed in chapter 1 and, at greater length, in Savage-Rumbaugh et al. [1993].) The aim of these tests was to apply rigorous methods of scientific proof to show that Kanzi really could understand the meanings of some kinds of spoken English sentences and to determine what levels and types of syntactic and semantic complexity were within his grasp. The results strongly supported Savage-Rumbaugh's assertion: Kanzi really did understand sentences as well as a two-and-a-half-year-old human child. Nevertheless, these results still met with the same sort of skepticism from within the scientific community. Although some do believe that Savage-Rumbaugh is justified in claiming that Kanzi understands spoken English sentences of certain types, there are many more who believe that she does not have that justification or who are willing to accept the authority of those who insist that she does not. What is certain is that, in spite of the effort, time,

ingenuity, and money that has been expended on this and many other similar research projects, no consensus of opinion has yet emerged within the scientific community as to whether Kanzi, or any other ape, can justifiably be claimed to understand a single sentence, either of English or of any other natural or artificially constructed language. Given the lengths to which Savage-Rumbaugh has gone to demonstrate the justification of her claims for Kanzi and the other apes with which she has worked, and given the argumentative tools that remain available to any critic who wants to challenge the justification for such claims, it is far from clear how any progress will ever be made in scientific research on the communicational and cognitive abilities of apes. Indeed, as things now stand it is far from clear how any progress ever *could* be made.

Evaluating Metalinguistic Claims: Logical Prerequisites

Surely one of the most frustrating controversies in contemporary science is that in spite of awe-inspiring successes in countless research domains, it seems beyond the capacities of scientists and scientific techniques to come up with satisfactory answers to questions such as these:

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?

These are clearly important questions—some of the most important questions facing contemporary science. Moreover, at least at first glance, they do not appear to be particularly challenging. One might therefore be forgiven for thinking it a relatively straightforward, uncomplicated task to answer any one of them. After all, don't we determine countless times a day whether our interlocutors, for instance, understood what we said to them? Or whether, when they spoke, they were referring to that object or person over there? Surely it is therefore natural to presume that it is only a bit more complicated to find out whether, as is asked in (1), the bonobo Kanzi understood the sentences we said to him? Or, as in (2), whether Kanzi was referring to the red ball when he pressed the lexigram "ball"? Presumably, understanding is understanding and referring is referring, regardless of whether we're talking about a human or an ape. Therefore, finding out, for example, if our interlocutor has understood what we said to him or her should, in principle, be the same sort of task with ape interlocutors as that which we regularly accomplish with our human interlocutors every day.