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Beyond Speciesism

Sue Savage-Rumbaugh

Stuart G. Shanker

Talbot J. Taylor
William & Mary, txtayl@wm.edu

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CHAPTER 4

Beyond Speciesism

Apes Have Language: So What?

Do apes really have an intellect that encompasses what we would call language? And even if one were bold enough to conclude that they do, why should we think that the utterances of apes will tell us anything about human language, or the formation of the human mind? Why, for that matter, should someone be interested in the question of whether or not apes have language? If language is innate—part of the "human birthright"—then what of import is to be found in ape language research? Even more to the point: Isn't the idea that another species should learn a human language anthropocentric? Shouldn't we learn their "language" if we want to understand them? These are the questions that will be addressed in this concluding chapter.

It is our belief that the epistemological biases and presuppositions that we have examined in this book have prevented scholars from recognizing the full implications of the basic behavioral and cognitive similarities that extend, in various forms, throughout the primate order. The linguistic competencies displayed by Kanzi and Panbanisha potentially undermine the assumptions that undergird much of modern linguistics, psychology, and philosophy. This is the reason why a large part of the "ape language debate" has centered around whether or not the capacities of the ape subjects are being represented in an accurate manner (Wallman 1992). Rarely, in science, has the presentation of data been subject to so much dispute or discrediting. Generally, it is the interpretation of data that serves as the focus for debate. But in the case of ape language, almost any interpretation of the data leads inevitably to a redefinition of man and the sciences that study man. Hence, those scientists who are not yet ready to entertain the possibility that a group of animals may be proficient in the capacities of language and reasoned thought have made the data itself the focus of concern.

Our Shared Heritage

When considering data from ape language studies, we would do well to recall that our species (*Homo sapiens*) offers but one among many solutions to the problems of survival as a social primate. Evolution is about surviving, and the anatomy and

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the capacity to discern what one should and can do with the anatomy inherited from ones' forebearers are the parameters of survival. It is often assumed that animals simply respond mechanically to their environment, and that any "learning" that they might require in order to survive is of a very different order than that required by man (Bickerton 1990; Lieberman 1991). This assumption is mistaken. Animals raised in an artificial environment can rarely survive if returned to their natural habitat unless they have a "mentor" who teaches them what is safe to eat, how to locate food, how to avoid predators, and how to establish the sorts of relationships with other animals that are necessary for survival and reproduction. Other primates, like man, spend most of their infancy and juvenile periods of life acquiring and refining these skills (Chevalier-Skolnikoff and Poirier 1977; King 1994).

Each anatomical plan provided by natural selection sets certain constraints on its inhabitants (Goldfield 1995). Once constraints are set, the sorts of solutions to problems of survival that a species can adopt are limited. For example, if a forest habitat becomes dryer and the food rarer, the solutions—both anatomical and behavioral—that are adopted by primates will surely be different from those adopted by elephants or large cats. It is also true that any anatomical solution must be preceded by a behavioral one. For example, early hominids may have become efficient bipeds in order to cope with a decrease in the area of the rain forest. But if this was the case, then before there were any changes in their anatomy that made this possible, there had to have been changes in their behavior: that is, nonefficient bipeds were trying to make their way across the savanna. The solution to move out onto the savanna and to adapt a different way of life came first and in turn forced a solution on anatomy. Anatomy is always, in a sense, playing catch-up with the more flexible brain.

The important anatomical parameters of the primate solution to survival include hands that have the ability to grasp; eyes that have the ability to see color and depth; and brains that enable the inhabitant to develop extensive social matrices based on individual recognition, kinship, and previous social encounters (Bramblett 1985; Hinde 1983; Schultz 1969). Their large brains also enable primates to recall food resources across decades and variable seasons; to coordinate social cooperation toward commonly recognized goals; and to communicate their desires and intentions to one another (Nishida et al. 1992). Human politics are basically primate politics elaborated and altered to deal with existence in the modern city-state, in which most inhabitants no longer know each other as individuals (de Waal 1989).

The genus *Homo* shares the basic primate survival plan, with a few important additions. Our brains are larger relative to the size of our bodies, and our shoulder girdle is uniquely adapted to permit hand-over-hand movement in the trees. Together these adaptations produce the ability—developed to a high degree only by man—to propel objects rapidly through space (Klein 1989). There are three more unique physical constraints that differentiate *Homo* from the rest of the primate order. Our hips have become wide and more horizontally angled, so that they are able to support the weight of a continually erect spine. Our infants have lost all ability to support themselves by clinging. And we have become endowed with small teeth that cannot shred or pierce (Feder and Park

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1989). Of these changes, it is the need to carry infants that differentiates us most from the rest of the mammalian order (Savage-Rumbaugh 1994).[1] All other mammals either cache their helpless infants in a nest, or the infant is able to cling to its mother's body. Our infants cannot be left alone, and they are unable to cling. Therefore it is up to the human mother to keep the infant with her constantly, without assistance from the infant itself. It is from the needs provoked by these fundamental anatomical facts that the peculiar way of life of the human species has arisen.

The appearance of these physical differences was, we now know, of relatively recent origin: beginning perhaps no more than four to six million years ago and completed in only the last million years. The needs for survival that gave rise to man prior to that time are identical to those that gave rise to the four other ape species. For reasons that are unclear, apes appear to have changed far less from the last common ancestor that hominids shared with them than we have (Schick and Toth 1993). Although some hypotheses have been offered, we do not yet fully understand why we are bipedal, why our infants do not cling, why our teeth are so small, or why our brains are so large. But whatever the reasons, we can be certain that they reflect the outcome of behavioral decisions that pushed the anatomy toward a new use that was not easily accommodated at first.

However, regardless of the reasons why humans diverged from apes, it is nonetheless a fact that we shared the same body plan and the same environmental pressures for millions of years. Indeed, for more than 99 percent of our evolutionary journey we were one creature. Thus, if we wish to understand ourselves in a manner that is not totally confined by the experience of being human, we need to learn as much as we can about the capacities that we shared with apes before we diverged on our separate journey. Human beings have changed so fast that it is all too easy to assume that our closest living relatives, the apes, are so distant and primitive that we have little to learn from them about ourselves. Certainly, if we consider modern technological society as the inevitable result of human intelligence, then it is difficult to see any but the faintest semblance of a link between apes and ourselves. However, the fact is that technology is not the inevitable result of human intelligence.

Primal Man

Many hunting and gathering communities existed until the end of the nineteenth century with lifestyles that differed little from that of apes, apart from the possession of a few extremely primitive stone tools and fire (Service 1962; Weyer 1959). Such societies would probably still be extant were it not for the advent of long-distance air travel, which has brought the "fruits" of the modern world to virtually every stone age culture. Even the remotest of peoples now sport T-shirts that have somehow made their way through thousands of miles of trackless forest, along with a few metal pans, knives, and machetes.

Nonetheless, there are still human groups that live by daily hunting and gathering in remote areas of New Guinea, South America, and Africa. In some parts

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of Africa, many of the foods these hunting and gathering groups consume are the same as those eaten by apes living in close proximity (Kano 1992). Indeed, there is little difference in their lifestyles, apart from the humans' use of fire, and weapons for hunting. In this situation, man's bipedal stride means that he must hunt on the ground, and his knowledge of fire enables him to cook his meat (perhaps a necessity brought about by his small teeth). His dwellings are constructed on the ground, but they are temporary, and in many cases only slightly more elaborate than the tree nests of his ape cousins.

It is primarily because stone age peoples have language that we think of them in quite different terms from apes. From their language we have learned that they have a complex kinship structure, an organized cosmology, and many sets of rituals and rules for social conduct. Because we learn these things by talking to such peoples, we naturally assume that language itself not only is a vehicle for communicating the existence of a complex mental life, but is the agent responsible for generating that complex mental life: that without it there would be no such cognitive capacities (Bickerton 1995). But this assumption rests on an anthropocentric view of human uniqueness. We have concluded that we are different from all other living creatures as regards the capacity for reason and morality simply because other creatures have not been able to tell us, in a language that we recognize, of such things. But had we looked solely at the behavior of stone age hunting and gathering human groups, we might still regard these peoples as little more than apes who had developed primitive tools and mastered fire, and who specialized in the hunting of meat.

We know much more about such people simply because we have talked with them. When an anthropologist sets about to study a remote human group, the first step he/she takes is to learn the language of the people through the assistance of an informant. The second step is to interview individuals in order to ascertain the kinship structure and the cosmology of that group. In sharp contrast, the first step of an anthropologist setting about to study apes is to follow them about at a distance, not reacting with them in any way, in order to habituate them to his/her presence. Imagine what would happen if an anthropologist adopted such a strategy with a human group! Any person who constantly followed the group about without interacting or speaking with them would be regarded as crazy and would not be tolerated.

Apes may not think the anthropologist crazy, but they do appear to resent the constant stare of persons who remain outside the group. Sometimes they make friendly overtures and at other times they display aggressively. Once a group becomes "habituated," they find it difficult to avoid researchers without going out of their way to hide for long periods, or by traveling on other than their accustomed routes. Since they no longer fear being shot, they find it easier to tolerate the observers than to avoid them. Moreover, apes themselves join other groups by hanging around on the periphery and slowly making friends. Thus it may not seem all that odd to them when a lone researcher begins to hang about on the perimeter of the group. However, when a small army approaches with notebooks, cameras, and so on, and does nothing but stare at them, this surely must be disconcerting.

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Since there are no ape informants, and since we assume at the outset of all investigations of ape behavior that one should not attempt to integrate oneself into the group, we are destined to arrive at a picture of apes that differs to an extraordinary degree from the picture we paint of hunting and gathering peoples. Our very techniques of research lock us into the odd position of claiming that all animals—even our closest relatives—possess a way of life and a mental existence that is completely dissimilar to our own (Bennett 1991; Lieberman 1984; Pinker 1994; Wanner and Gleitman 1982). We make this assertion despite the fact that, before the last four million years—a mere blink on the evolutionary calendar—we lived as one species; or that apes' brains, bodies, behavior, facial expressions, and emotions are nearly identical to our own; or that their child-rearing patterns are similar and that their infants go through many of the same developmental phases as do our own offspring. Moreover, the wealth of evidence we now possess from captive research shows us that apes are not dimwitted creatures who lack the ability to think creatively, to plan ahead, or to organize a structured set of patterned actions and interactions (Wrangham et al. 1994; Tuttle 1986). Why do we ignore the self-evident commonalities between apes and ourselves?

We humans desire a means of relating to other animals on the mental plane. It is not enough for us to know that another species looks like us, or even that their lives are like ours. We need, it seems, to make a mental connection—whatever that may be. Is this possible? Is it somehow possible to learn whether our long common history of shared body and brain extends in any way to the realm of the mind?

There have been two separate sorts of attempts to understand apes. One has been to observe them in the wild, and the other has been to study their language and other cognitive capacities in captivity. It is often asserted that the only "real data" regarding nonhuman primates must come from field observations (Reynolds and Reynolds 1995). This assertion is like insisting that the only "real data" about man must come from locating the few remaining remote tribes that are untouched by modern influence in the Amazon or the highlands of New Guinea. Certainly, we need to know far more about such peoples, for they offer unique perspectives on what it is to be human. But no matter how much we learn about small groups of human beings in remote areas, nothing we find from such studies could ever prepare us to predict the behaviors and the inventions of modern man. How could we discern, from studying stone age cultures, man's potential for the development of mathematics, the discovery of electricity, or the technologies that allow words and pictures to be distributed worldwide in a matter of seconds?

Discussions with any such technologically primitive group would quickly reveal that they were capable of imagining worlds that they could not see; of understanding and constructing abstract relationships between dissonant categories of things; of acquiring basic mathematical skills; and of learning other languages. Through such intercourse we could assure ourselves that technologically primitive man could come to live in, and possibly even adapt to, the modern world. But we would find no basis on which to predict that stone age man could have, or would

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have, if given sufficient time, created this world that we now inhabit. Indeed, if we did not know that the world of modern man existed, our studies of stone age man would surely cause us to conclude that a society whose inhabitants willingly packed themselves together into towering concrete structures, and who were able to communicate with each other across oceans by nearly instantaneous invisible waves, was another species whose intelligence greatly transcended stone age man. Indeed, members of remote hunting and gathering groups readily assert, on hearing stories and seeing videos of what the "outer" world is like, that these other people are fundamentally different from themselves, and that they could never attain such competencies.

We know that man has the potential to create the modern world only because it exists. We assume that it could be created by the mind that typifies individuals living in extant hunting and gathering groups, even though these groups have not made significant indigenous inventions in their cultures for thousands of years. We assume this not because of anything we see in the behavior or the culture of such peoples, but because individual members of such groups speak to us in a way that reveals that their mental worlds are populated with the same sort of concerns and flights of fancy that we ourselves manifest. It is this "mental connection," made possible through language, that permits us to declare that these stone age peoples are every bit as "human" as ourselves. The conviction that the mental lives of apes are devoid of such concerns and flights of fancy is based on the presupposition that discussions with apes are impossible. The fact that simple conversations do occur with captive apes who have acquired language is discarded as "irrelevant," because it is said that the behavior of such creatures is not genuinely linguistic, or even that it is somehow "unnatural" for the species (Pinker 1994; Sebeok and Rosenthal 1981; Wallman 1992).

Those who take such a stance fail to recognize that apes, like human beings, must be studied under a wide range of conditions before it is possible to begin to understand what it means to be an ape. Their behavior, like ours, is highly adaptive, versatile, and flexible; but these traits do not readily show themselves in the wild, where life appears to follow the same rhythm day after day. It is only under "tight conditions," where pressure is suddenly put on the group from many different but often invisible sources, that the remarkable ingenuity and creativity of the nonhuman primate mind manifests itself in a way we can easily grasp. Short of these conditions, the primate mind—including our own—is a rather lazy sort of apparatus, able to do infinitely more than is demanded of it on a given day. And so the observer of apes in the wild can easily be fooled into thinking that they live a life of relative ease, never bothering or able to better themselves (Byrne 1995).

Indeed, it has often been observed that although apes have a far larger brain than monkeys relative to their body size, they often seem to do much less in the wild. Surely the brain of early man, which was considerably larger than that of an ape, would equally puzzle any field primatologist able to peek in on a free-living troop of *Homo erectus*. Apart from spending some time smashing rocks together to make extremely crude tool flakes, the daily life of *Homo erectus* would not require, in any obvious way, a brain the size of which filled his calvarium. Apes

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in the wild sometimes spend hours a day smashing rocks together in order to open nuts (Boesch and Boesch 1983; McGrew 1992). Smashing rocks to create a sharp edge does not, on the face of it, require vastly greater intelligence than that demonstrated by apes who crack nuts using a stone anvil and hammer-stone (Schick and Toth 1993). Certainly there is nothing about producing a flake of rock that would indicate the existence of an intelligence which would eventually lead to the concertos of Mozart, the theory of relativity, or the understanding of electromagnetic fields.[2]

The trouble is that neither the existence of intelligence nor its potential manifestation is necessarily self-evident from observing behavior in "natural circumstances."

Wholistic Intelligence

It was the predictability of food resources brought about by the domestication of plants that meant that man no longer had to follow a nomadic way of life, forever moving about in search of food as the resources in one place dwindled and those in another became abundant. Apes, and a few small human groups, are still moving in lockstep with changing food cycles, trying to predict them efficiently, rather than trying to control them as modern man does. It takes intelligence—a great deal of it—to predict what nature is going to provide, and when, in quantities large enough to feed forty to sixty individuals. It also takes intelligence to coordinate the movements of all the members of the group. Such social behavior cannot be random but must be constantly organized in a manner that keeps the group integrated and well fed. Nature is not eminently predictable: her cycles change from year to year, across decades, and over even larger spans of time. If it were not easier to predict the availability of food by growing crops, man surely would not have done so, since it is certainly more work to tend crops than it is to simply pick those that nature provides. It is also less pleasant to be bound to a field than it is to wander freely about in the forest.

The kind of intelligence required to survive well off what nature provides is no longer obvious to modern man, as he himself is never required to do so. Instead, the kind of intelligence that controls crops, animals, objects, and inventions is the kind that is of value to modern man. This object-oriented, hierarchically structured intelligence is what we now prize most; and because we prize it so, we look for it when we attempt to study ourselves and the manner in which we manifest intelligence (Lakoff 1987; Mervis 1987; Rosch 1973). Any structure that can be characterized as "hierarchically organized" is viewed as a good and marvelous manifestation of the human mind (Chomsky 1957; Posner 1989).

Of course, not all that we do can be interpreted through the lenses of hierarchy and category. Some forms of intelligence, which have been termed wholistic or Gestalt, result from an organization of the parts that is neither hierarchically structured nor dissociable. That is, one cannot break wholistic or Gestalt constructions into subcomponents while preserving any sense of the whole; nor can one systematically build the whole from the subcomponents. The subcomponents seem to arrange themselves into an alignment that has no partlike existence, other than

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the whole they form. Thus it is sometimes said that the whole is greater than the sum of its parts. But such a characterization is inaccurate, for the parts really exist in the mind as "parts" only by virtue of the whole having already been "seen" by the mind. If the whole had never been seen, the parts themselves would not exist in our perception (Shipley 1995). Many perceptual figures have such characteristics, but so do integrative theories and great works of art. In these realms intelligence is organized at a synthetic level that focuses on what is achieved rather than the process of the achievement.

It is this sort of intelligence that is required to live within nature, to adapt to her ever-changing environment and food supply, and to learn the things that one needs in order to survive each day. In the rain forest, food must be located by new and nonobvious means each day. It is this sort of intelligence that allowed man to cope with life before he learned how to make his world increasingly predictable by the domestication of crops and animals, and before the invention of a calendar and the subdividing of "units of time."

The kind of intelligence that accepts whatever nature offers from one moment to the next, and tries only to predict what is the most efficient thing to do given the current situation, is what the brain of *Homo* evolved to do for the entirety of our existence on the planet prior to the domestication of plants and animals. Only in last twelve thousand to fifteen thousand years have we begun to try to conquer nature (Jones, Martin, and Pilbeam 1992).[3] Now, just as it seems we are about to "conquer Nature," we are beginning to realize that our success in this endeavor may be only an illusion. We are starting to see that the by-products of our actions—such as the exhausts of the fuels we use to subdue nature—can so alter the planetary balance of atmospheric and oceanic transport mechanisms that it may become impossible for our species to continue to exist, much less carry on as we have been doing (Vig and Kraft 1994).

As enamored as we are of the hierarchical intelligence that has generated our modern technological advances, it is useful to recognize that this sort of intelligence is a relative latecomer on the scene, and that it may have a limited sort of usefulness. We need to view hierarchical intelligence as a subset of a more global intelligence: a subset that is highly developed in modern man because of our constant emphasis on the manifestation of category and structure in all aspects of our lives.

Hierarchical Intelligence

The nervous system, being a very plastic sort of affair, can be extensively restructured in response to events that take place shortly after birth. For example, when a sense organ is destroyed during infancy, the portion of the brain originally programmed to process information from that organ becomes preempted by nearby structures. When this happens the motor and sensory areas of the preempting structure become far larger than they are in normal individuals (Churchland 1986). It is frequently the case that hypertrophied skill goes along with this increased space. Thus feet can become able to type efficiently, or, for a person lacking sight, sound

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localization and kinesthesia can become so astute that they nonetheless are able to learn to ski.

Similarly, just as limbs or sensory systems can grab extra space, it is reasonable to suppose that one form of intelligent information-processing could take over large portions of brain function, to the detriment or even elimination of other forms of intelligent processes. Taking such a perspective, it becomes possible to conceive of man as an ape who, by virtue of his relatively recent emphasis on hierarchical intelligence, has altered his behavior and consequently the functioning capacity of his nervous system to such an extent that he now exhibits a hypertrophied intelligence of a particular sort. This hierarchical intelligence has become extraordinarily adept at designing buildings, computers, and other artifacts of modern society, but it also now makes it difficult for humans to recognize intelligence that manifests itself in nonhierarchical thought. In the most extreme form of brain specialization, some individuals become "autistic savants." These persons exhibit intelligences that are capable of "superhuman" feats of calculating dates or mathematical sums, or exhibiting extraordinary talents in art or music, while at the same time displaying almost no capacity for the social intelligence required in daily life. The existence of such individuals suggests that the brain has a remarkable capacity to specialize or focus on a single sort of information-processing ability to the exclusion of all others. It is as though a single function or topic has so usurped the entire brain that the individual cannot do other than become an expert in that one area while simultaneously neglecting self-development in all others.

When an autistic savant answers a math question in a few seconds that none of us could calculate in several minutes, even with pen and paper, we are inclined to think that some sort of "higher-order" intelligence is operating, even if the person is socially inept in all other aspects of life. However, when an ape convinces forty other apes that it would be wise to travel to location A, a trip of three hours travel time, because fruit should be ripe there, we are likely to dismiss this feat as the execution of a simple "instinct." Even more troubling is the fact that anything an animal does that receives the label "instinct" is deemed at once to be a form of behavior that has no reasoned premise. Such is the power of words that a complex act of our own species can be seen as intelligent even in an individual known to be deficient by all normal standards of human behavior. But complex behavior in our ape relatives can be termed "instinctive" and dismissed without further ado.

What results is a tautology of sorts. If a behavior is said to be "innate" in an animal, then we must assume that the animal carried out those actions without reflection as to their consequences, and lacking advance planning. All that occurred was that some stimulus presented itself in the environment and the animal proceeded to mate, or display, or hide, or engage in whatever action was innately linked to the environmental stimulus. When a human behavior is said to be "innate," it means that the propensity to learn a complex skill was already present in the human being prior to being shown how to do the task at hand. Thus we find "human being" to be another word for "cognitive ability," and "animal" to be another word for "innate stimulus-driven actions"; and we see the category boundaries between humans and animals as immutable and preordained.

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Language and Mind

Only by getting some insight into the mental world of animals can we break down these conceptual boundaries that we ourselves have erected. While we may eventually discover many ways of doing this, right now we have only one—and that is language. We need to talk to the apes, and we need to listen when they talk back. Since it is not likely that we are going to meet an ape on the street with whom we can exchange pleasantries—if we want to determine whether or not they are capable of language and thought, we are going to have to depend on the reports of those who do talk with them. At least we are going to have to do this until we become more proficient at recognizing intelligence by other means.

Certainly, in the case of modern hunters and gatherers, we discern intelligence by talking to them. Talking—for us human beings—is the manner in which we come to convey what we call our "intentions." Since we believe that "intentions" undergird all our conscious actions as well as the actions of other human beings, we often find it difficult to relate to animals because we cannot understand their "intentions" or indeed, even if they have intentions (Dennett 1983). Talking is also the way in which we human beings convey our "thoughts" to one another. Knowing some of the thoughts of people in other cultures, we have come to conclude that they share a wealth of mental experiences that are similar to our own. So it would seem to follow that if we want to understand apes, we would do well to talk with them, if such is possible, since talking seems to be our human means of getting to understand other entities.

Since apes, like stone age peoples, do not live across the street or appear in universities, we shall have to rely on the reports of those who have attempted to cross the species barrier and establish communication with apes, just as we rely on anthropologists to travel to New Guinea and bring back reports of the lives and capacities of those peoples. Many linguists, philosophers, and psychologists are unwilling to accept these reports, however. At first this hesitancy was based on the fact that language, as employed by apes, was taught by techniques of conditioning and molding, leaving little reason to assume that apes either understood what they were saying or what was being said to them (Terrace 1985). However, it has been clear since the mid-1980s that apes can learn language without being taught and that their comprehension of what is said to them far exceeds their ability to speak (Savage-Rumbaugh, Sevcik, Rumbaugh, and Rubert 1985). This limitation is not because of any cognitive deficit, but simply because they lack a human larynx and diaphragm. They lack voluntary control over the regulated exhalation of air, and they lack the glottal stop capacities needed to form consonants. Thus, when they do try to speak, the sounds come out in brief unmodulated bursts that lack phonemic distinctiveness (Crelin 1987). But they do try to speak; they even try to speak clearly. Yet, like many retarded or autistic persons or persons born with speech defects, apes simply cannot speak. Those apes that do learn to comprehend language remain, like retarded or autistic persons, locked in a body that cannot express what the mind can understand and conjure. By all observations and accounts, this appears to be a very frustrating affair for such apes.

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However, the fact that apes like Kanzi, Panbanisha, Mulika, and Panzee have learned to comprehend and produce simple language when raised in an environment where they are spoken to and treated as competent communicative partners has not had the impact on the fields of linguistics, philosophy, psychology, and behavior that such findings would have had if the results had been accepted as legitimate accounts of ape behavior (Savage-Rumbaugh, Murphy, Sevcik, Brakke, Williams and Rumbaugh 1993). The reports of those who talk to such apes are accused of being produced by persons who are "too close" to the apes. Closeness to animals, it is assumed, biases one's thoughts and one's data (Sebeok and Rosenthal 1981).

Similar closeness to human beings is *not* assumed to unduly bias one's thoughts or one's data. Even though anthropologists working in a New Guinea tribe become close to their informants, and even though Piaget became close to his children, such reports were never deemed "suspect." By contrast, any report of something Kanzi has said is immediately classed as "suspicious," regardless of the nature of the evidence. Two observers might have seen the utterance, it could have been filmed, it could have been repeated or expanded on—but all these "confirming facts" will be overlooked if the utterance occurs as part of a two-way relationship between an ape and a person. Because the conversations are reported by a human partner, it is suggested that somehow they are tainted. Of course, the logical outcome of this position is that the things that apes say cannot be accepted as serious science unless the apes are able to engage in the reporting of scholarly data on other apes. Obviously, if such criteria continue to be held by large numbers of the academic community, it will be some time before any insight is gained into the mental lives of apes or other nonhuman creatures.

Relationships are an inevitable part of real linguistic communications. Normal execution of linguistic exchanges takes place not in a vacuum but rather between two or more individuals who are attempting to coordinate their actions by exchanging information about their intentions, goals, plans, and desires. Language in children emerges in the same sort of crucible; indeed, children are indoctrinated into a culture through the vehicle of language. By learning language they acquire the formal, nonstated, and unconscious ways of their society. Language becomes the glue that binds the individual into the matrix of social expectancies, responsibilities, and moral principles.

Language is, in a sense, the abstracted portion of the culture, the part that can be lifted from the ongoing stream of action and discussed at the level of "metaaction." In this sense, language is behavior about behavior. It is used to determine what "we" are going to do next, in a constantly changing stream of events that are only partially predictable. Without language, any single individual can determine autonomously what he or she will do next, and if the behaviors of individuals do not need to be coordinated, the decisions of single individuals are sufficient. However, whenever behaviors must be coordinated—and they must when any two individuals are going to interact by exchanging patterns of action—communication about this coordination must take place before the intertwined actions themselves occur, unless these patterns are completely predetermined.

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Linguistics and the Innateness Conundrum

Linguistics has achieved a modicum of success in its drive to produce a hierarchical analysis of language by lifting language out of the stream of interaction and studying it only as meta-action. The function of this meta-action, in the arena from which it emerged and in which it continues to operate daily, is declared to be unimportant to the understanding of language itself. In other words, language is assumed to have become such a complete system of meta-action and such a complete reflection of the cultural expectancies that generate it that it can be properly studied of its own accord (Newmeyer 1986; Wasow 1989).

Before the advent of written language, it would have seemed odd to attempt to study language as a phenomenon that existed apart from situations that included the intentions of the speakers and the effectiveness of the utterances (Olson 1994). However, the existence of written language made it clear that communication of some form could occur in a nonsocial setting. The sentences that emanate from the mind of a writer are generally more carefully thought out than is his or her speech. They are more grammatically complete and correct, since writing permits one the luxury of reviewing, editing, and changing a statement after it has been made. In real-life exchanges, such luxury is absent.

By assuming that the intentions, goals, and desires of the speaker were irrelevant to the analysis of language, linguistics attempted to permit itself to formalize the study of the patterns of language in a manner that did not depend on any sort of "meaning" inherent in the content of the utterance itself. It strove to achieve the formalism inherent in mathematics, where relationships between symbolic quantities can be shown to hold regardless of the specific numbers that are used to compute the equation. Through such formalizations linguists strive to specify the underlying principles of language, in the same manner that mathematical physics strives to specify the nature of the physical parameters of the universe. Linguists also seek to discover constants, equivalent to pi or the speed of light, that can be utilized within the formalisms to demonstrate the applicability of their formalistic approaches across all languages.

Students of mathematical physics have historically ignored minor fluctuations in their equations caused by variables that are difficult to compute in fact, but easily understood in principle. For example, the wind resistance determines how far a golf ball will travel and where it will land, just as does its original mass, its weight, and the force and direction of the blow that sets it on its course. However, wind resistance on any given day varies from moment to moment and is more difficult to compute than the other factors, which themselves determine the basic trajectory and distance traveled and which always direct the ball to the same spot in an ideal system. Therefore, while wind resistance is viewed as a real factor, it is not taken into account by formulas of classical physics that attempt to predict the behavior of objects of a specific mass, under the influence of gravity, when acted upon by a certain force. It is assumed that the essence of the way in which the physical world operates can best be understood by focusing on principles that undergird that operation in a constant manner while ignoring things such as wind resistance that can, on a given day, vary moment by moment.

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Thus, just as the formulas of classical physics can determine the trajectory and landing position of a golf ball, linguistics seeks similar formalisms in language. But rather than searching for invariant relationship between numbers, linguists search for invariant relationships between categories of words, where the categories themselves, such as verb and noun, are devoid of semantic content. By understanding the formalisms that are assumed to underlie the relationships between such syntactical categories, linguists hope to write the mathematics of language. They assume that the formalisms operate in a manner similar to that of mathematical equations in physics. Once the correct mapping rules have been deduced, language can be reduced to mapping the semantic meaning of words onto the rules, just as physicists can plug numbers into equations. It is the equations that give the general relationship; the numbers only compute a specific one. Similarly, the underlying formalisms of language are thought to embody the patterns of human thought—words give forms to the patterns, but do not alter them.

Linguists anticipate that once they achieve their goal, just as the laws of classical physics permit us to compute the trajectories and landing positions of balls of any size, struck at any location on earth, the formal rules of language will permit us to interpret any sentence in any language. Difficulties in so doing will reflect not inadequacies in the rules but minor cultural factors that operate in a manner analogous to air resistance.

A corollary of such a linguistic perspective is the view that the formalisms that underlie grammatical competency must be inherent in the human brain, just as the formalisms that underlie classical physics are thought to be inherent in the physical world. And just as no one "teaches" a golf ball where to go once it is acted upon by physical forces, so, it is thought, no one teaches a child the formalisms that undergird language. Indeed, the relationship between these underlying formalisms and the speaker's external language is assumed to be dependent on more than just innate mechanisms for structuring linguistic utterances. It is assumed that these mechanisms form the basis for all human thought. They are, so to speak, the inherent mathematics of our brains. Without the presence of such algorithms, human beings would be completely unable to carry out the basic parameters of human thought, because thought itself is held to be the forming of various systematic relationships between different classes of events.

The goal of linguistics, then, is seen as none other than the discovery of the mathematics of human thought, where the term "mathematics" is used to imply the logical formalisms that are presumed to underlie all complex hierarchically organized thought. And, most important for our purposes, it is also assumed that none of these formal mechanisms that are said to underlie thinking are present in any species other than humans (Chomsky 1957; Pinker 1984).

These formalisms are viewed as a set of equations locked within our brains that permit us to interpret and produce novel sentences. Lacking them, it is assumed that all we would be capable of is the learning of simple associative response chains between external events and actions on our part that had been rewarded in the past. With them, however, we are suddenly provided with the capacity for self-reflexive thought. Because of them the "I" versus "you" distinction emerges, and reasoning man (and woman) is born.

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Certainly this view of language is attractive and has much to offer to all who wish to simplify the study of language. If such an important aspect of our existence can be reduced to basic equations, we can build computers that will readily and easily translate one language into another. We could even ask them to do such tasks for us as read complex text and render it into simpler form or to take transcripts of real-life conversations and sort through the "words" to find the underlying dynamic of the exchange.

The Problem Posed by Kanzi and Alternative Resolutions

Of course, the inherent attractiveness of a given perspective and the degree of truth with which it maps to the reality of language are not necessarily one and the same. Kanzi's ability to comprehend complex language throws a very large wrench into the engine of linguistic thought (Savage-Rumbaugh and Lewin 1994). It can accommodate this intrusion in only a limited number of ways.

One is to discredit the data that Kanzi and other apes provide. This was the initial approach, and it is still taken by many; however, it is becoming increasingly less plausible with every new accomplishment by Kanzi or other apes. Another approach is to accept the data but to extend the formal capacity for reflexive thought to apes as well. The main problem with this strategy is that currently there are no reports of language in the wild. If apes are capable of the formalisms of reflexive thought, the idea that they would not be utilizing this capacity in conditions of nature seems (to scholars who assume that self-reflexive thought is what generates the emergence of mind) too appalling to contemplate.

A third approach would be to grant the data, but to assume that the formalisms that account for this behavior on the part of the ape are different from those that account for human behavior. This approach would have the advantage of granting humans cognitive uniqueness, while still allowing that something more than conditioned associations is possible in other animals. The problem with this approach is that no one knows what other sorts of formalisms to postulate if not ones based on syntactical structure, or at least a logic structure that takes as its starting point the same sort of hierarchial/sequential intelligence that manifests itself as syntax in language (Langer 1986, 1993; Greenfield 1991). Our current models of learning offer only two choices: conditioned associations or reasoned hierarchical thought structures generated by the equations of language.

A fourth approach is to grant the data and the apes' capacity for formalisms, but to abandon the view that such formalisms are innate in man or ape (Shanks 1994; Reber 1989; Brooks and Vokey 1991; Vokey and Brooks 1992) . This view assumes that the formalisms of language are constructed anew by each individual in the process of becoming a competent social being who engages in communication with other social beings for the purpose of coordinating complex patterns of behavior. This approach is the one taken by this book. It was the one taken when the decision was made to raise Kanzi without attempting to teach him language. It is our view that the fourth approach is the one that is closest to the real truth of language and the only one that will lead to a clearer under-

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standing of how we, as human beings, construct human minds through the vehicle of language.

The difficulty with this approach is that if it is the one closest to the truth, it means that we cannot learn about the rules and regularities of language by lifting language out of context and studying it as meta-action apart from behavior. We must study it in the messy real world that it naturally inhabits. It also means that if these formalisms are constructed anew by each language participant, we cannot rely on biology to pass them along effortlessly from generation to generation. If we value the sort of linguistic edifice we have constructed as a species, we may actually have to work to keep it going. This is such a shocking thought in itself that many scientists elect to abandon the fourth approach for this reason alone. Those who can bring themselves to go beyond this difficulty find that their attempts at research become bogged down in the multitude of variables that make up what we call real life.

Psychologists and linguists have never been able to study real life—the problem has been that they do not control real life. The paradigms of research that we have inherited from classical physics insist that we must attempt to gain knowledge by controlling one parameter at time. Some might feel that newer statistical techniques like multivariant analysis and factor analysis will enable us to overcome this obstacle, since this permits us to deal with more than one parameter at a time and, hopefully, to sort out the "variance" in our data due to a number of different parameters. Still, these new methods only accomplish this feat by controlling one parameter at a time while looking across all others. They do not neglect the classical concept of control, they merely rotate it across variables.

The formalisms of linguistics have achieved great popularity precisely because they have lifted language out of the context of real life and reified it in a manner analogous to the reification of basic forces achieved by classical physics. This reification is based on the seemingly viable assumption that language can be set apart from the realm of the social relationships in which it is embedded. The justification for this assumption arises from the fact that, in a literate society, language does indeed exist in a sphere that is nonsocial. One can, as I am doing now, write down one's "thoughts" without another party present in form or corporal being at all. The "other party" in such a case is only the "imaginary reader." However, aside from the use of written language (a skill that appeared only about six thousand years ago and still is absent in many of the world's languages), language is embedded in the spoken relationships between people (Piggott 1961; Olson 1994).

The Issue of Intentionality

By reifying language in this manner, linguists have almost managed to do away with the issue of intentionality. That is, the intent of the speaker, in producing the utterance, does not need to be taken into account in the formulation of rules that govern utterances. Again, this method follows that of classical physics. The intent of the golfer who hits the golf ball need not be taken into account in the computation of the ball's trajectory or where it will land. It is sufficient that we know

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the direction and force of the blow; this, along with our knowledge of the mass of the ball, will enable us to predict where it lands. The fact the person who hit the ball "wants" it to land somewhere else is irrelevant; the forces of the physical world are such that they need not take into account "desires" that underlie the cause of action, nor do they need to deal with the cause itself in any direct manner. It is sufficient that they predict the relationship between the initial application of force and its consequent effect.

By the same token, linguists assert that the intention of the speaker need not be taken into account when attempting to understand the formalisms that underlie all utterances. It is sufficient that these formalisms make it possible to generate, and to interpret, all potentially possible utterances. If the intent of the speaker is not met, he or she, like the golfer who can hit another ball, can utter another sentence. On the face of it, this seems a simple enough solution. However, this seemingly simple solution harbors a great difficulty that is hidden in the apparently appropriate analogy between evaluating the trajectory of a golf ball and the appropriateness of an utterance.

The golfer, whose ball lands in the rough, does not conclude (most of the time, anyway) that the forces of natured "wanted" his ball to land in the rough. He simply concludes that he hit it improperly, and he makes another attempt to direct the ball where he wants it to go. However the speaker of a language is in quite a different situation. Any sentence directed toward another party may not have the intended effect—for any number of reasons that have little, if anything, to do with the manner in which the original sentence was uttered. The other party might not have heard it, she might have heard only part of it, she might have heard all of it and not understood it, she might have understood something quite different from what the utterer intended, she might think that she understood and thus act as though she did when she did not, and so on. The problem is that the speaker never knows exactly where any given utterance has landed in the same sense that he knows precisely where his golf ball has landed. Utterances do not have a direct effect on a listener in the same sense that actions do. They are meta-action.

This fact becomes quite clear if one takes a simple example like "pushing." When party A actually pushes party B, A can observe whether or not B really moves. A may just be trying to push B over so that there is room on the bench for both, or A may be pushing B off a cliff. Whatever the intent of A, the results of his actions toward B will be self-evident (including, of course, the fact the B may well push back far more forcefully than A anticipates).

However, once we move out of the realm of direct action and into that of indirect or meta-action through the hand of language, the methods by which we evaluate the effects of our behavior are drastically altered. Suppose, for purposes of example, we find that professor A is trying to "push" professor B into accepting her view of the importance of viewing autistic persons as unable to form a "Theory of Mind." The ability of A to evaluate the effect of her utterances becomes a very different sort of affair. Some of the utterances of A may actually speak to facts about known deficits in social capacities in autistic individuals. Other utterances may reference the names of well-known individuals or granting organizations interested in this phenomena. Others may describe individual personal experiences

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with autistic patients, and so on. A may also attempt to "push" B not only by talking to him but by talking to other parties with the intent that they then talk to B on her behalf. But how will A know if she has succeeded?

The only means A has of evaluating her effectiveness is some change in the utterances of B. B may begin to talk "like" A, saying the same sorts of things about the causes of autism. However, it is quite possible to talk like A without adopting A's views. A knows this and so will monitor B for other clues as to whether her efforts have achieved the desired ends. Does B cite her work on autism, does B approve her grant requests, and so on. B, on the other hand, will be trying to interpret the "intent" behind A's utterances. Is A pressing him to adopt a view known not to be compatible with his own hypothesis of autism as a sensory disorder because A needs his support, or is it because A does not really understand that he is working on the problem at a more fundamental level? Why is A so concerned that B does not cite her work when it clearly is not relevant to what B is doing? Of course, such an example can be continued and elaborated in far greater detail. The simple point is that A and B's inferences regarding the intent of each other's utterances become the focal point for determining the effect of language.

Utterance interpretation is composed of three variables: the words (and syntax) that are used; the inferred intent of the speaker; and the immediate physical context surrounding the utterances that is taken as common knowledge by both speakers. These variables are not equally weighted in all circumstances. In most cases the inferred intent carries far more interpretive weight than the words. To take a simple example, suppose two guys are sitting at a table, and as two attractive women walk past one looks up and says, "Let's go fishing." It is not likely that the other one will assume that the next thing they should do is drive home and begin to look for their fishing poles. It is also not likely that any formal analysis of language structure that is lifted from the context will provide an interpretive account of the utterance.

The simple fact is that most of our exchanges place a great deal of weight on the interpretive variable. Once we are in an exchange, we cannot, as can the golfer, simply hit our ball over again. Every previous utterance affects the interpretation of our current utterance. Consequently, utterances are not independent events as are shots from the tee. The interpreted intent that engulfs each utterance guides the effect of each utterance as surely as the angle of the blow guides the ball through space. The difficulty with this set of events is that we currently have no means of externalizing, objectifying, and measuring "intentionality." Nonetheless, it is relatively easy to see that lifting language out of the medium of use is not going to give us the rules for predicting the effects of utterances, because the effects are not determined by the formalisms of structure alone. Even more important are the inferences made regarding the intent of the utterance. These inferences are so influential that they can easily override the ordinary interpretion of both syntactical rules as well as that of semantic content. Thus the meaning of an utterance such as "go fishing" need have little to do with the content or structure of the utterance itself.

The simple fact of the matter is that words can mean what ever we elect them to mean, and we can change meanings extremely rapidly, even at times within the

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same sentence. The idea that there is a dictionary that allows us to look up the meanings of words confuses us. It makes us think that the meaning of a given word is in the dictionary—in some way oddly inherent in the word itself. But it is not, it is only in the usage; this is why a word such as "fish" can so rapidly change its meaning. How is it then, if words have no stable meanings, that we can interpret the intent of the speaker, and how is it that children, much less Kanzi, learn what words mean, if their referents are indeterminate to any significant degree?

Social Constructionism

To answer these questions, we must take the fourth approach to the language problem. We must begin by assuming that the ability to think and reason as a cultural and linguistic being in a given society is constructed anew by each individual during the process of coming to behave as a competent member of that society. This approach is not new. It has roots in the social constructionism of John Shotter (1990, 1993), in the language as a guided reinvention perspective of Andrew Lock, in the "making-sense" through acquisition of shared meaning stance of Katherine Nelson (1985), in the joint attention framework of Jerome Bruner (1983), and in the language games of Wittgenstein (1953) and protolanguage games of Canfield (1995). All these approaches use slightly different terms to get at a common theme. The common underlying theme is a social account of how language comes to map onto, to regulate, and to guide both action and thought.

Language is seen first and foremost as an inherently social process, one whereby the nature of interaction between a mother and her child leads naturally, spontaneously, and in a sense effortlessly, to the acquisition of structured thought, manifest first in structured patterns of interactions that are mutually understood and anticipated by both participants. The second manifestation of the same process appears on the linguistic plane and is marked first by the use of language to coordinate interaction, second by the use of language to control the actions of the others, third by the use of language to proscribe and plan the actions of others, and fourth by the use of language to alter the linguistic expression of the opinions of others. Each of these levels of language use builds on the former.

There is, however, a singular difference between the theoretical perspectives formulated by those working with normal human children and the perspective that has resulted from the capacities demonstrated by Kanzi and now confirmed by three other apes. The perspectives just offered are limited to human beings. They concentrate, for the most part, on the interaction between a mother and a child, and they illustrate the ways in which the perception of the caretaker both structures and refines the actions and utterances of the child as the caretaker seeks to encourage the child to take an increasingly greater role in their joint interaction. The caretaker is presented as having a very fine knowledge of the infant's perceptions as well as of its abilities. This knowledge permits the caretaker to structure the world around the child at a level that is only slightly beyond the child's current capacity to deal with things on its own. Certainly it is true that most middle-class American mothers behave in this manner. And in America, we have parenting

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classes for those mothers who do not know how to accomplish the feat of "interacting with their children at the appropriate level."

Yet somehow mothers who have no such classes manage to raise remarkably healthy and socially competent infants; and studies that have attempted to find a link between maternal scaffolding abilities and linguistic competency continue to come up empty-handed. Indeed, short of severe neglect, it has proven difficult to demonstrate that anything done during the period of language acquisition has a profound affect on a child's speech or quality of learning. While such negative findings should not be taken to imply that the social acquisition account of language is incorrect, it is nonetheless difficult to understand why caretakers who appear to be more efficient at scaffolding do not, in effect, have children whose language is more advanced, if indeed the development of language is dependent on such scaffolding.

The Perspective Shift Driven by Kanzi

A perspective shift becomes inevitable when one attempts to look at the processes of language acquisition and enculturation in a developing organism that is an ape rather than a child. Not only is Kanzi an ape, the first two and a half years of his life were spent in the constant company of his natural ape mother. Since the life span of apes is equivalent to two-thirds of that of a human child, Kanzi was raised by Matata to the human equivalent of 3.1 years of age, or throughout the critical developmental period for language acquisition. Matata did no language scaffolding for him and very little behavioral scaffolding. Nor did the human caretakers fill the gap, as they were focused not on scaffolding language for Kanzi but rather on training Matata. Their goal was to teach her to select the proper symbol in order to be vended a specific food. She experienced great difficulty learning to discriminate between the geometric patterns of the symbols themselves. The first ten months of her training were devoted to teaching her to recognize a single pattern from among many others, when all patterns were relocated at every trial. The remaining ten months were devoted to teaching her to associate one of each of the six patterns that she recognized with a specific food. She was required to search through ten patterns that were relocated at each trial and select the one that corresponded to the piece of food in a vending machine just outside the room. The food changed every few trials.

Such training, which is hardly akin to the scaffolding processes of the human mother, cannot account for Kanzi's progress, since he did not participate. Although he had adequate opportunity to watch what his mother did, the fact that he never seemed to do so is perhaps misleading. It is common for parents to report that their children picked up things to which they appeared to be paying no attention. Indeed, most parents assert that this happens all the time. However, even if Kanzi was secretly watching, the discrete trial training that Matata received cannot alone account for why Kanzi was easily able to discriminate lexigrams and to associate them with specific foods and events. Kanzi's younger siblings, Panbanisha and Mulika, never observed such training sessions, yet they

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had no difficulty discriminating lexigrams, and they came to comprehend spoken language just as did Kanzi.

Yet the many studies of joint attention, scaffolding, acquisition of shared meaning, and guided reinvention all place heavy emphasis on the role of the caretaker in the "passing on" of the culture and language. This role is not just that of modeling appropriate behaviors but also that of fitting oneself into the child's actions in a manner that is designed to promote increasing competency on the part of the child. This "teaching role" of the parent is even regularly asserted to be one of the most important distinguishing traits of the human species, and it is often assumed that without such efforts our offspring would not become competent adults (Greenfield forthcoming; Tomasello, Kruger, and Ratner 1993). It is of more than passing interest that in a society that places considerable emphasis on the role of the parent, the role of the parent is being handed over to other caretakers with increasing frequency (Clarke-Stewart 1989). These caretakers are no longer part of the extended family, as was the case during the majority of our evolutionary history, but trained "specialists" in the art of child care. We tend to view it as increasingly important that such specialists understand their role in coordinating their behaviors with those of the child in their care.

Not having been trained in the art of scaffolding, Matata let Kanzi do pretty much whatever he wanted. Because the experimenter working with Matata was focusing on training Matata, she also let Kanzi do pretty much whatever he wanted. Kanzi kept himself extremely busy playing with a variety of toys and practicing his acrobatics on ropes hung up for that purpose. Somehow he still managed to learn to tell one geometric pattern from another, to differentiate the speech sounds that his caretakers were using, to match these speech sounds to different geometric symbols, to associate both the sound and the symbol with specific foods, objects, and events, and to use these symbols, in combination with each other, as well as with gestures, to announce his own desires. These skills went far beyond those he observed in his mother. One is reminded of the manner in which children who learn a pidgin language develop it into a creole in one generation, even though they have no model for a creole. This fact is often cited as evidence for the fact that language is innate (Bickerton 1984). If one were to follow this sort of logic, then, given the fact that Kanzi's understanding and use of lexical symbols went far beyond anything demonstrated by his parent, one would have to conclude that lexical symbols are innate in apes.

Of course we know that this cannot be the case, just as we know that written language and mathematics are not innate competencies of the human being. We know these things because we know that the systems of writing, mathematics, and lexigrams are recent inventions and just like ideas such as the telephone or bow and arrow—they cannot be innate. The point remains, however, that the logic by which many have reached the conclusion that language is innate could be employed with equal appropriateness toward many other skills known not to be innate. If such an argument would produce a misleading conclusion about the innateness of lexigrams for Kanzi, it can clearly lead to incorrect conclusions regarding the innateness of language in our own species.

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Since it is reasonable to assume that neither lexigrams nor spoken English would be "innate" in a bonobo, and since neither Kanzi's mother nor the experimenters working with her scaffolded Kanzi's rapid development of lexical production and English comprehension skills—how did Kanzi learn? And how can anything that he did be said to be due to some sort of social construction of behavior between him and his caretakers?

Quine's Dilemma and Locke's Puzzle

Before embarking on an attempt to answer these questions, it is necessary to consider the pitfalls encountered by previous attempts to explain the puzzle of language acquisition. There are two pivotal questions underlying many of the current theories and discussions regarding the acquisition and function of language. The first is that often referred to as Quine's dilemma (Quine 1960). This question asks: How is that children come to know the referent of any communication directed toward them without already knowing the structure of the language and/or the meaning of the words that are used? After all, if one points to a field containing horses and cows of various colors doing various things, grasses of various sorts, along with bugs, odors, sounds, and wind, how is the child to know what the adult means when he says, "Oh, look at the cow eating some grass"? The second question, often termed Locke's puzzle (Taylor 1984), asks how it is that language can ever be adequate to convey the thoughts of the mind of one speaker to that of another, since all words are imperfect representations themselves of what is in the mind of the speaker. Taylor (1984) puts the problem as follows: "As the hearer cannot know the thoughts of the speaker, he cannot be sure what the words of the latter signify. That is, the words you utter express your own ideas; but when I hear those words, I can only interpret them as the signs of my own idea. Thus language fails to perform its required task of providing an intersubjective conduit between our minds" (209).

These two problems are related in that both revolve around the issue of reference, yet they remain distinct. With regard to the dilemma as posed by Quine, we assume that *if* one knew the referents of words and *if* one knew the syntactical structure of the sentence, one would then be able to know the speaker's true intent. The problem for Quine is how these two sets of knowledge get put into language in the first place, for if both semantics and syntax depend on the other for their existence, there seems to be no way in which language could ever be initially acquired. The puzzle as posed by Locke, however, does not accept the fact that reference can be clear, even when the semantics and syntax are given capacities of the both speakers. The problem revolves around how it is that reference can ever be determined, since "the same words have in different mouths, and often in the same, very different meanings" (Condillac 1798, 1:762).

The problem of how it is that a child can deduce the meaning of "Oh, the cow is eating some grass" seems to be resolved, in a manner of speaking, by Chomsky's assertion that the rules for decoding syntactical structure are innately given. Thus

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if the child can deduce (through an innate application of the appropriate rules) that the word "cow" is the subject of the sentence and that subjects, when linked to transitive verbs like "is eating," are generally agents, and that agents are generally animate living beings, then the child will understand that the word "cow" must apply to an animate thing in the field. Furthermore, if the child also understands that the word "grass," which follows the transitive verb, specifies the thing that the subject acts upon, then the child will know to look for an animate being acting upon an object. Finally, if there are not too many other agents in the field acting on things, then the child can deduce that the adult must be referring to the cow that is acting on the grass. Because the child can see that the cow is ingesting the grass, he or she can therefore deduce the meaning of "eat."

Thus, according to this account, all that is needed for the emergence of a proper understanding of language follows from the correct application and understanding of the principles of syntactical structure. Clearly, however, such accomplishments are not simple. How do children manage them? Parents have not been observed to instruct their children in how to interpret sentences like "The cow is eating some grass," therefore linguists have concluded that this capacity must be innate (Marcus 1993). They assume that the child is born in possession of an innately given capacity (generally termed a LAD) that easily permits the child, indeed compels the child in a manner not under the child's own volition, to appropriately decompose the sentence and thereby deduce the intent of the speaker (Pinker 1994).

The difficulty posed by Locke is not so easily explained, however. If we grant that a LAD can explain how the child understands a sentence linked to physical entities of the real world, we nonetheless remain at a loss to explain how it is that an adult understands more abstract concepts. Let us take a sentence such as "It might appear that one would not know how to make use of conventional signs if one were not already capable of sufficient reflection to chose them and attach them to ideas: how then, it might be objected, can the exercise of reflection only be acquired by the use of signs?"

Knowing that the subject of this sentence is the word "It" does little to tell us exactly what the referent of "it" might be. The word "it" is used again after the semicolon, but here "it" has a different referent, which is equally vague. Being able to look up the dictionary meaning of the word "appears" and knowing that it functions as a verb in this sentence also tells us very little. What is the "it" that "appears," and where can it possibly appear, except in the mind of the reader? It seems that the more we try to use semantics and syntax to unravel the meaning of this sentence, the more the meaning vanishes—yet syntax and semantics are said to be the tools through which we generate meaning. What is wrong here? And how is that we understand this sentence at all? This is Locke's puzzle and it forces us to see that while syntactical and semantic explanations help us to understand the process of language in some cases, what we refer to as "meaning" goes far beyond these simple parametric levels of explanation. Indeed, if we were to rely solely on them, it is doubtful that we would be able to hold meaningful conversations with one another.

Many of those who would attempt to answer this question have realized that its roots must lie hidden somewhere in the origins of language. Condillac (1798)

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espoused the view that it is man's innate ability to reason that distinguishes him from all animals and that initially sets him on the path to language acquisition and use. It is also this power to reason that permits him to reflect on his own actions and to develop a language whose referential powers go beyond the meanings assigned to given words to be able to intuit the intent of the speaker. Thus, in contrast to Chomsky, Condillac asserts that reason is the engine that makes language possible and that it is reason that is innate, rather than the other way around. For Condillac, it was the emergence of the intention to communicate that set man apart from the animals and on the path to language. Syntax is simply a fallout of that set of events. Due to the complexity of language that man began to use, he needed some means of ordering the rapid flow of his words so as not to confuse his listener.

According to Taylor:

> Condillac believed the use of conventional signs to have originated in natural expressions of emotion. A cry of fear upon seeing a lion, for example, is a natural, context-determined response. It is important that such a response is context-determined. Even a complex "vocabulary" of such responses (expression of pain, of fear, of joy, etc.) would not constitute a "true" language from Condillac's perspective because the production of any one such vocal response would not be under the control of the speaker. It would depend on the occurrence of the appropriate context-stimulus. Mastery of such a vocabulary, then, would not allow man to exercise control over his mind for it would not yet even constitute control over the use of the vocalizations themselves.
>
> An important step would be taken when man came to live in society with other men. For he would then hear the same vocalizations produced by those around him and would recognize them as (natural) signs of the emotions felt by the producer. By this stage, then, the emotional cry is not simply a response to felt emotion; it also acquires a use, albeit as yet an uncontrolled and unintentional one. That is, it now also serves as an intersubjective link informing others of the speaker's emotions. But the most crucial stage is passed when man comes to use such natural signs, not simply in uncontrolled response to emotion, but with an intention to communicate. For instance, from a high tree I might see a lion creeping up on you; I would then use the "fear vocalization" to warn you of that danger, even though I do not myself feel threatened by the lion. Thus, my production of this natural sign would have been the expression of my intention to warn you, rather than a simple uncontrolled reaction of fear.
>
> This is an important step because, for the first time, the stimulus which triggers the fear-vocalization is, in a sense, self-generated by the intention to warn. (Condillac makes no mention of where such an intention might have "come from." We can only assume that it is a natural endowment.) . . . the key to Condillac's argument lies in his "demonstration" that the source of the artificiality of "true" language-using lies in its originally being an imitation of a natural behavior pattern, viz. the natural behavioral response to emotional stimuli. Thus, the guarantee that we all use language in the same way inheres in the fact that the ability to use language is based on a more primitive, shared, natural stimulus-response system. (1984, 215)

Taylor summarizes Condillac's position on the origin and use of language by stating that it encompasses three crucial factors: a natural stimulus-response system, intentionality, and a social-cooperative system. Thus Condillac may be said

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to be, in a sense, the first thinker to argue about language and reason from a social-constructionist perspective.

Jerome Bruner is the modern thinker who has done the most to elaborate on such a perspective. Bruner does not deny Chomsky's assertion that innate syntactic rules exist; however, he asserts that the child could never become able to even apply the rules if many other abilities were not already in place, some of which are learned through social interaction and others of which are said to be innate as well. On the "innate" side, Bruner credits the child with the innate intentions to refer, to deny, to request, to seek mutual attention, and to query, as well as an innate ability to follow a point and to follow the gaze of a cointeractant. Of course, it is not that Chomsky believes such skills are learned—he does not care whether they are learned or not, as he is not interested in anything other than grammatical analyzers. This is not to say that he assumes such skills are unimportant, only that they are irrelevant to the development of language. For Chomsky, any portion of language that must be learned is an uninteresting portion.

To Bruner, a psychologist, it is unthinkable that something as complicated as a LAD could operate if the child did not already understand the basic pragmatics of communication—which, for Bruner, entails an understanding of the topics to be communicated, the intentionality of the communicative process, and its general referential nature. Unlike Chomsky, Bruner recognizes both the critical nature of these abilities and their complexity. For him, the child's acquisition of intentionality and reference are as mysterious as the grammer module is for Chomsky. Consequently, he reaches the conclusion that these abilities must be innate as well.

Thus it seems, as Taylor points out, that no matter how we get at the matter of language, we are left with the problem that as long as we are attempting to specify what portion of language is innate and what portion is learned, we shall find that "innate" is simply another word for the part of language that we cannot explain. Of course, the same issue holds if we attempt to explain reason or consciousness. The centrality of language with regard to the innateness issue is critical only to the degree that one holds (as do Chomsky and Pinker) that it is language that permits reason and consciousness to operate. Is such an assumption valid? It has been deemed valid as long as humans have been thought to be the only animal that uses language. It has been easy to see that other animals do not speak as we do. It has been far more difficult to determine whether or not they have reasoning abilities and whether or not they are conscious. To the degree that we limit our acceptance of the existence of reason and consciousness to their expression via language, we can remain comfortable in asserting that other animals can neither reason nor experience consciousness in the same manner that we can.

If, however, we hold that reason and consciousness, especially self-reflection, are a priori capacities that underlie language and that they can exist independently of language, then we must at once conclude that animals have both the possibility of reason and consciousness, but that we do not recognize these processes in them because they cannot express them by means of language.

Prior to the initiation of ape language studies, these issues were generally of interest only to scholars of linguistics and philosophy who considered them in the

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hypothetical sense. Since no animal exhibited language, it made sense to consider reasoning, consciousness, and language as expressions of some underlying competency on the part of man. Exactly which of these skills came first, and how it happened, were matters for speculation, but not much more. With the first reports that an ape named Washoe was learning signs, centuries of Western thought regarding the nature of mind were challenged (Gardner and Gardner 1971). But Washoe was not like a child, in that she did not reason her way into language but rather was taught "words" through the presentation of an object followed by the molding of her hands into the sign for that object. No one knew whether this was really language or not. At first it was thought that Washoe might not be able to generalize to objects other than the specific one that was held up, but she quickly did this without difficulty. Then it was thought that Washoe might not be able to combine her signs but only be able to use them for single objects. This, too, she was able to do without difficulty. Did Washoe really have semantics and syntax? And if she did, how did she acquire them simply by having her hands modeled when an object was held up? Did this mean that she had a LAD as well, and that apes in the wild all had LADs but were not using them? This puzzle was clearly as profound as Locke's original one.

But the closer one looked at Washoe's utterances, the less they looked like language. The first problem was that she did not evidence clear comprehension when others signed to her (Savage-Rumbaugh, Rumbaugh, and Boysen, 1980). She seemed much better at expressing her needs than she was at listening to and complying with the needs of others. Was this just the result of her egocentric personality, or was Washoe only aware of what it was that language achieved for her rather than its general representational capacity? A second problem was the repetitiveness of her utterances. Sentences like "You me hurry, Me you food hurry, Food hurry me you, Hurry hurry, Food hurry?" were commonplace. Why did Washoe use so many words over and over, and why were signs like "you" and "me" a part of so many utterances?

The third problem was the most significant: Washoe did not seem to learn signs unless she was taught them. Often it took hundreds of trials or more for her to learn a new sign, and even then the new sign would be confused with other recently learned signs for some time. There were many signs that Washoe did not spontaneously produce unless someone held up or pointed to an object, as though the "stimulus" was needed to be present to induce the sign. In short, Washoe's ability was startling, but was it language? Washoe knew what to do with her signs, but did she really understand what the signs themselves did in terms of her communications with others? It was not clear that Washoe's language possessed a syntax or that she fully understood the representational power of language (Savage-Rumbaugh 1984). It was clear that she understood what the use of signs could achieve for her, and, in a sense, this understanding was a simple form of reason (Gardner, Gardner, and Van Comfort 1989). It was not evident that she could use language in the service of reason or that she understood or produced syntactically structured utterances; however, it did seem abundantly clear that Washoe was conscious and that she was intending to communicate.

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Nonetheless, linguists and philosophers could continue to ignore the claims being made on Washoe's behalf as long as Washoe was being taught language. In itself, on the very face of it, the fact that Washoe had to be taught signs made it possible to dismiss her abilities as a number of higher-order conditioned responses that readily generalized across training exemplars. Real language learning was a feat that children accomplished quite readily on their own, and the ability to reason one's way through a maze of complex speech to an understanding of language was viewed as quite a different process from being taught to pair hand motions and objects (Leiber 1984; Sebeok and Rosenthal 1981).

Why Kanzi Could Not Be Ignored

It was more difficult to ignore the fact that Kanzi began to comprehend speech and to learn symbols without any training. Kanzi's language skills were clearly not situation specific, and the range of novel sentences that he understood was unlimited. His symbol use was generally spontaneous and nonrepetitive. Kanzi made it increasingly difficult to draw any sort of line between humans and apes that was based on language alone. Certainly, most humans understand more complex language than does Kanzi, but there no longer can be said to exist any real differences between the way Kanzi learns and employs language and the way we do the same thing. Of course, it remains possible to impugn the validity of the data and the honesty of the experimenters, and such continues to be frequently done (Pinker 1994). Yet Kanzi continues to demonstrate that these abilities are real, as does his sister Panbanisha. Given the overwhelming weight of the evidence, the conclusion that apes have a capacity for language can no longer be evaded.

Once we have accepted this conclusion, it can quickly be seen that none of the explanations of language as an "innate" capacity remain adequate. It really does not matter whether we are asking how Chomsky's LAD becomes activated so as to permit grammatical competence to emerge, how Bruner's Language Acquisition Support System (LASS) becomes activated so as to permit the prelinguistic suit of skills that include intentionality, reference, the ability to follow gazes and points, denial, and so on, how Condillac's pure reason leads to the invention of language, or how Lock's mothers unwittingly guide their children to reinvent language. It does not seem reasonable to suppose that Kanzi had a latent LAD or LASS, nor did his mother guide him to reinvent language. These are simple facts. They are not complicated in any way, nor are they the result of some statistical anomaly. Kanzi's sister Panbanisha has shown that Kanzi is not unique. If more bonobos were raised with early exposure to a much wider variety of symbols from birth, there is every reason to believe that their language skills would be far more gramatical and complex than those of Kanzi and Panbanisha. These simple facts mean that our current explanations regarding the manner in which our species acquires and passes on language have to be incorrect—not just partly, but completely incorrect.

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So how *did* Kanzi learn? With what do we replace the current theories of language acquisition? Before offering an explanatory account, it is important to recall the explicit things that Kanzi and Panbanisha are able to do, and the circumstances under which these capacities have made themselves manifest.

1. They have learned to differentiate English phonemes, and they understand combinations of these phonemes to be words (Savage-Rumbaugh 1988).
2. They understand words spoken rapidly and in the sentential contexts, where the use/meaning of the word differs from sentence to sentence and depends not only on the rest of the words in that sentence, but also on previously uttered sentences, the ongoing social and physical context of the sentence, and the historical context that is common to themselves and to their listener (Savage-Rumbaugh 1988; Savage-Rumbaugh 1990).
3. They know the written symbol that corresponds to many of the spoken words. They can use this symbol to communicate even though they cannot speak (Savage-Rumbaugh et al. 1986).
4. They comprehend the syntactic aspects of utterances. They understand that pronouns such as "it" refer to previous sentences. They understand that word order can be used to signal a different sort of relationship so that Kanzi biting Sue is not the same thing as Sue biting Kanzi. They understand pronouns of possession such as "mine" and "yours." They understand expressions relating to time, such as "now" or "later." They understand qualifications of state such as "hot" and "cold." They understand that one clause within a sentence can modify another portion of the same sentence, for example, "Get the ball that is outdoors, not the one that is here" (Savage-Rumbaugh et al. 1993).
5. They follow the thread of conversations that they hear around them, even if they are not participating in such conversations.
6. They can make stone tools—by observing others do the same.

All these capacities appeared without special training on the part of the experimenters. Kanzi and Panbanisha were treated as though they could come to understand what was being said to them, and they were expected to try. If they failed, attempts to make the communication clear proceeded at the level of actions.

Having clarified what Kanzi and Panbanisha are able to do, it is equally important to note what they have not done.

1. They have not produced any speech that is readily interpretable as an English word, though they do attempt to do so.
2. They have not progressed in the development of language skills at the extremely rapid pace shown by normal human children.
3. They have not gone as far as normal human beings.
4. Their short-term memory capacity is less than that of normal human children, making it more difficult for them to imitate sequences of utterances or actions with only minimal exposure.
5. They have not become integrated into a human community as a full social member, with both rights and responsibilities.

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None of these deficits, however, cause the abilities of Kanzi and Panbanisha to stand outside the realm of what we usually think of when we apply the term "language" to behavior.

The Malleability of the Nervous System

Any attempt to "explain" how Kanzi and Panbanisha achieved these skills will have to rely, to some extent, on some biological endowment, some "innate" component. Kanzi and Panbanisha are, after all, biological entities that bring to the task a specific anatomy. So at the outset, we have no alternative but to set out those components of the behavior that we cannot otherwise explain. Kanzi and Panbanisha brought to the task of language learning a visual-auditory processing system that was able to separate the speech stream into components that they could perceive as words. They also were able to resolve the visual world of symbols into lexigrams that, to them, appeared distinctly different and to which they could match sounds. We do not know how they did this. We do know that the age of their exposure to the sounds of speech and to the geometric configuration of the lexigrams was important. Three other bonobos who were not exposed to spoken language and visual symbols during infancy (Matata and her offspring Tamuli and Neema) remain unable to differentiate speech sounds reliably or to match sounds with lexigrams. Similarly, they have great difficult visually resolving the differences between the lexigrams, though with extensive training, this visual skill can slowly emerge after the age of three. However, if exposure occurs before the age of three, it proceeds rapidly and becomes a highly developed ability without any special training.

The perceptual problems in forming sound discriminations from the ongoing speech stream are underappreciated, probably because this happens at such a young age that none of us recalls the process. Furthermore, during infancy there is no obvious clue that it is or is not happening. This is why autism is typically not diagnosed until it is clear that a child is not speaking language. However, long before the time of speech, the processing of the units of the spoken language is proceeding at several different levels. The child is learning to segment the speech stream into its components of phrases, words, and phonemes (Kuhl 1986). The fact that the child is able to make the appropriate segmentations of the speech stream is more of a mystery than is the later appearance of syntax (Peters 1983). These differentiations, made as the child listens, not as it speaks, are in no way given or obvious.

One has only to attempt to study the vocalizations of another species to immediately realize the difficulties in separating a stream of sound into some sort of meaningful units. If there is no way to tell where words start and stop, there is also no way to decompose them further into their morphological units. Given such a problem, each sound that one hears is as different from the preceding sound as one sentence is from another. Imagine attempting to determine the meaning of a sentence if all you ever heard were different sentences, not the words within the sentence. No two sentences that are exactly alike in intonation and pattern would

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ever be heard. Without any recurrent patterns, how would you ever crack the code? If one could not break a sentence down into patterns that themselves are identified as being patterns one has heard or seen before, it would be impossible to understand a new sentence. For we do not recognize a sentence purely on its physical basis, but rather by breaking it down into units, units that we have encountered before and thus are able to classify at the level of words or sometimes at the level of phrases.

While we do not know how Kanzi and Panbanisha began to identify individual words, it seems quite probable that the process of pointing to specific words as they were spoken aided the development of this ability. By pointing to a visual symbol and speaking slowly, the speech stream was altered so as to give reliable visual and auditory "breaks" between at least the words that were on the keyboard. Still, there were no phonemic pauses in the speech, so the ability to separate speech sounds at this level remains a mystery. The capacity of human infants to do this has also been recognized as inexplicable and has been attributed to an "innate phonemic parser" by some accounts and to the motor theory of speech by others (Liberman et al. 1967; Lieberman 1975).

Kanzi's ability to understand different speakers, even those with an accent, as well as synthesized speech, means that this capacity cannot be due either to an "innate component" of sound processing ability found only in humans or to the motoric ability to produce speech. The quite surprising fact that, in bonobos, there seems to be a critical age for exposure to speech, even though they do not normally speak, implies that the developing brain has an extraordinary capacity to process patterns of incoming stimuli. Such a pattern-analyzing mechanism must search to extract reliable subcomponents of information. The fact that bonobos have a critical period for the understanding of human language reveals that language patterns, as they become analyzed, in some manner imprint themselves on the brain, making it possible to analyze similar patterns again in the future by rapidly identifying incoming stimuli as similar to a previously encountered pattern. The more rapidly new patterns can be identified, the more quickly additional information can be taken in. The abilities that we have thought were "innate" in human beings can now be seen as the result of the early structuring of the brain, by the brain, as it responds to stimuli within the environment that are important to the organism.

The fact that we learn to identify speech sounds at such an early age, and that we are not aware that we are even doing so, causes us to underestimate the complexity of such a skill. Thus, many people do not think it unusual that an ape should be able to understand speech. Indeed, the capacity to do so is attributed to dogs, elephants, and other animals as well. So little study of the abilities of such animals has been made that it is not known whether these animals have learned the individual sound patterns of each word, or whether they have extracted the phonemic patterns as well and can understand words even if they are spoken by speakers of different ages, by a person with an accent, or by a voice synthesizer. We also do not know if they can extract a word when used in a speech stream, if they can extract more than one word from the speech stream, or if they can relate words in the speech stream to one another.

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The fact that Kanzi and Panbanisha can do so means that the brains of other animals may have this capacity as well if they are exposed to the speech stream at an early age, in a situation where it is an important part of their daily surroundings as well as affectively motivating. We do not fully understand how the developing brain determines which stimuli are sufficiently important to merit the devotion of a dedicated and intense pattern-analyzing process. This is an important decision, one that will affect the potential capacities of the organism throughout the rest of its life. The fact that the brain is sufficiently plastic to orient itself toward analyzing many different sorts of stimuli suggests that the organism comes prepared to cope with a wide variety of environments—and that any seeming similarity within a given species may be due to all individuals within that species making similar decisions about how to allocate their pattern-analyzing capacities at a very early age, rather than a fundamental, unalterable biological given.

The development of what is loosely termed the emotional system of the brain (including the basal ganglia, the amygdala, the thalamus, and the hippocampus) plays an important role in orienting the attention of the organism. The different rearing experiences of the various bonobos in our projects speak directly to this issue. Both Kanzi and Panbanisha developed an easy facility with human speech, while Matata, Tamuli, and Neema have not done so. Language training efforts began with Matata when she was approximately six years old. They continued for two years and were renewed after the birth of Kanzi, when they continued daily for another two and a half years. During the entirety of this time, Matata was in the company of experimenters who engaged her in social interactions throughout the day that were of interest to her. They also used the keyboard when speaking to her, and they encouraged her use it. Matata showed no capacity to differentiate individual words, though she did listen and respond to intonational pattern.

During the second training period, Kanzi was with her at all times, so that any speech the caretakers utilized was heard by Kanzi as well as by Matata. Kanzi, however, learned to process this speech input as words, while Matata did not. Kanzi's primary emotional attachment was to Matata, but he quickly became attached to the human experimenters as well. They carried him for many hours each day at his request, and with Matata's approval.

In contrast, Neema and Tamuli, two other infants born to Matata, did not develop as strong an attachment to experimenters at such an early age. They did hear speech, however, used around them throughout the day. The difference was that the speech that Kanzi heard was directed toward him by "socially significant others," that is, persons who interacted in a direct physical manner with both him and his mother. Such persons groomed Matata, often held and carried Kanzi, and tickled and play-bit both of them. When Neema and Tamuli were small, caretakers typically interacted with Matata only through the cage wire. They spoke to her and sometimes interacted with her physically, but always at a distance because of the wire. Such interactions are not as sensitive, it is never essential to get along with an ape that is in a cage—one can walk away if things do not appear to be going well—but it is essential to develop and constantly maintain a social rapport with an ape that is not in a cage. With young apes this is not especially difficult,

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but with adults who have infants, such rapport comes only through the development and maintenance of close and affectionate bonds.

Thus, both Kanzi and Panbanisha experienced apes and humans as "socially significant others" at an early age, while Neema and Tamuli experienced them, at the same early age, as caretakers who brought food and played with them through the wire. Out of this differential social importance attached to human beings during the first three years of life emerged these capacities: the ability to parse speech sounds into words, and to understand the referential aspect of speech; the knowledge that spoken words corresponded in a one-to-one manner to lexigrams; the ability to attend to and discriminate the visual lexical components of the communication system that accompanied speech; and the ability to pair sounds and visual symbols as equivalent communicators, first in the mode of comprehension and then in production. All these skills emerged in Kanzi and Panbanisha prior to three years of age.

Matata, Neema, and Tamuli were all exposed to conditions in which humans became "socially significant others," but *after* the critical period for the development of such capacities. None of them became able to parse the speech stream into words or evidence any understanding that specific words were linked to specific lexigrams. They did understand that the keyboard, and sound, functioned as an indicative communicative system, and they attempted to use both. However, they selected any lexigram to convey their intent, just as Panbanisha did around one year of age, when they first begin to view the keyboard as a communicative tool. Their understanding could be expressed as "touch this special board and people will read your mind and do what you wish them to do." However, Panbanisha soon went on to the develop the concept that each individual lexigram could be used to convey different sorts of things and thus became highly selective in her use of the keyboard. Matata, Neema, and Tamuli did not. More important, Panbanisha retained the concept of specific symbol-object relationships even when touching a specific symbol resulted in other than the desired action (for example, when requests were denied or when other alternatives were suggested).

It is a well-known fact that during this early period, brain structures are rapidly forming, and the direction and degree of development is dependent on the experiences that the organism receives while this development is occurring. Schore (1994) has specifically proposed that there is "a critical period of synaptic growth and differentiation of an affect regulating limbic structure in the prefrontal cortex . . . and that this development process is significantly influenced by the stimulation embedded in the infant's socio-affective transactions with the primary caregiver" (13). In Schore's view, if the proper sort of affective environment and social exchange does not occur during this preprogrammed period of neuronal growth and myelination, the connections that are programmed to form between the limbic system and the prefrontal cortex never mature—that is, the prefrontal system never gains the ability to properly control and modulate the emotional and attentional systems of the brain. The prefrontal ability to do so is critical because the prefrontal area receives input from the visual, auditory, and somatasensory cortices—where information from the outside world is taken in and analyzed. In order to properly evaluate and focus

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on this information, the brain needs input to and from its emotional and attentional system. This process is what takes place in the frontal cortex. It is therefore critical that the cortical-limbic pathways become adequately developed and differentiated.

The differences in ability to process both speech and visual lexical information that appear in apes during this critical period implies that the development of the socioaffective attachment systems and the attentional systems are closely interlinked. Certainly both those apes who experienced humans as "socially significant others" (i.e., Kanzi and Panbanisha) and those apes who experienced them merely as "significant others" (i.e., Matata, Neema, and Tamuli) had sufficient and proper stimulation to permit the development of the frontal cortex and the maturation of the limbic system. All the animals display the normal social reportoire of behaviors that are characteristic of bonobos. None show evidence of being socially stunted. They do not avoid others, they have no stereotypies, they engage in frequent play and grooming, and they are interested in objects. Thus there is no reason to suspect that the neuronal differentiation and myelination has not proceeded apace in all of them. However, what distinguishes them is their differential capacities to process both visual and auditory stimuli of one particular type, that is, the visual and auditory stimuli that are particularly representative of the communication system used by the human experimenters who became "socially significant others" during a critical period of Kanzi and Panbanisha's development.

These facts indicate that Schore's hypothesis regarding the development of the brain regions regulating socioaffective development is perhaps too limited. Given the broad cortico-cortical interconnections between the frontal lobes and the visual and auditory centers of the brain, it seems likely that the limbic attention-orienting system is operating, through the mediation of the frontal lobes, on these regions as well. The considerably expanded ability of Kanzi and Panbanisha to process and extract information from stimuli that are particularly associated with the communication system of "socially significant others" reveals that the brain, during development, has a unique potential for structuring itself in a manner that makes it possible to rapidly extract increasingly complex pieces of information from the patterning of behavior of "socially significant others."

The extracting and processing of such information is apparently characterized, through the mediation of the frontal lobes, as intrinsically rewarding—probably because it results in increased coordination of the social interaction, which in itself is rewarding, for it is the coordination of social interaction that permits social interaction to be sustainable. Uncoordinated interaction becomes too difficult for the infant to manage, and retreat from the social interaction becomes the prominent means of coping. Coordinated social interaction provides the constant level of maximal arousal that is sustainable. Well-coordinated social exchanges themselves are driven to become more complex in nature to maintain the same level of maximal arousal.

While initial coordination may be with the mother, the infant is soon driven to move beyond coordinating its social arousal with hers; and by adding other individuals, the level of stimulation is increased, as long as there remains coordination of exchange. Of course, it is not only the infant that must find the social exchange maximally arousing within the limits of coordination, the mother and other individuals must similarly find the exchange mutually arousing and satisfying.

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While the neurological underpinnings that developed and guided the differentiation of Kanzi and Panbanisha's nervous systems remain to be determined, it is nonetheless the case that these two bonobos, by virtue of the context of their interactive exposure to speech, came to understand language with a competence that rivals that of human children. They also came to communicate by linking the sounds of words they knew to symbols printed on a board. The three bonobos reared without exposure to speech in an interactive environment failed to do these things. The skills that Kanzi and Panbanisha acquired developed even though their main social ties were with other apes.

They learned our language. They can understand it much better than they can speak it, but their inability to speak is a physical limitation only. Kanzi and Panbanisha acquired these skills because they organized their perception of human speech in a manner functionally different from that of their siblings who did not interact with people during a critical period of development. Once the stream of speech was decoded into "word units," the process of language learning followed by Kanzi and Panbanisha differed little from that of a normal child—with two exceptions: (1) it was much slower, and (2) they could not actually speak.

What these facts reveal, in a rather unequivocal manner, is that language is not innate in any meaningful sense of the word "innate." What they do not do is reveal how this feat was accomplished by the bonobo's nervous system. We don't know precisely the critical age or precisely the critical experiences, and we don't know how the brain "decides" which sort of incoming information to organize in such a high-level manner; nor do we know how it accomplishes that organization. What we do know is that once the ape brain has developed beyond three to four years of age, it can no longer "decide" to process speech information.

The fact that Kanzi and Panbanisha can process such information tells us no more about how it is accomplished than does the fact that we human beings are able to do this same thing. Lieberman 1984 points out that although we are unable to produce speech sounds at rates that exceed seven to nine items per second, we somehow understand speech that is transmitted at a rate of fifteen to twenty per second. He attributes our ability to do so to "specialized anatomy and brain mechanisms [that] allow us to make these speech sounds, and a set of brain mechanisms [that] allow us to "decode" speech signals in a very very special way" (38). Clearly, we can no longer appeal to a special brain mechanism evolved solely for the purpose of processing speech. If bonobos can develop the ability to process speech sounds, it is probable that we ourselves develop this ability. How we, or they, do so is still not understood, but the rapidity of speech comprehension relative to the speed of the nervous system suggests that an evaluation of speech comprehension theories is needed.

The organization of the visual and auditory cortex is a fact of nature that remains something of a mystery. As neuro-imaging techniques become more rapid and refined, we may begin to understand the link between brain maturation and experience and even be able to vary certain biological parameters via behavioral alterations. A tantalizing clue exists in the fact that the only brain of a language-competent ape yet to have been measured was 528 grams, completely beyond the scale of all previously recorded chimpanzee brain weights.

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The organization process itself is likely to remain more of a mystery. Indeed, it is one of those mysteries that is likely to grow, the better we understand it—just as is the mystery of the thing we call gravity. We understand how gravity operates in increasingly greater detail, but this is different from knowing what it is—we do not yet know this. We probably will learn what emerges in the brain and the experiences that sometimes assist the organization processes; but to truly learn how a complex self-organizing process develops—this may remain an elusive goal.

The Achievement of Meaning—with Language

Nonetheless, given that Kanzi and Panbanisha somehow achieved the organization of the world of human sound into "word" units, we can address the question of how they then came to realize that these word units stood for various items and events, as well as why they began to attend to relationships between these word units. We can address this process because language acquisition is essentially a social process derived from the interaction between two or more individuals. Thus it can be "externalized by behavior" in a way that the perception of the visual and auditory sound stream cannot.

The central question regarding the acquisition of language at the level of meaning is that of how it comes to be lifted partially out of the here and now of behavioral action, so that it achieves some sort of independent level or metalevel of existence. After all, a word can "mean" something only in the context of an interaction, not really in the context of a dictionary. And "meaning" can only be constructed out of the whole cloth of interactions between individuals. Something about our behavior is said to mean something to A. Our words change, in some manner, the mental state of A, or at least we infer that they do. Generally, we make this inference because A says that our words did change his mental state.

Of course, unless A's future behavior changes as well, we do not know whether his mental state has changed or not. And indeed, even if his future behavior does change, and we attribute this change to an alteration of his mental state, we still do not know that this is an accurate reflection of events, for all we can observe in A is a change in his behavior, not his mental state. We make, in our culture, the assumption that behavior reflects mental state and that mental state drives behavior. Thus we put ourselves in the difficult position of believing that we must change how someone thinks before we can change how it is that he behaves, as we believe that mental state drives behavior. However, on reflection, this "belief" is in and of itself somewhat shaky. For mental state is only an "intervening variable" that we postulate. We say it acts as some sort of mediator between our language behavior and the language behavior of the other party. When, as often, we don't see a direct response to our verbal comments, we assume that the change must have been held in abeyance in some manner, and we refer to this manner as one's mental state. We could as easily call it the operative memory bank as mental state.

This process of "lifting out" is seen a little more clearly in apes than in normal children—because it happens more slowly, and because it does not always take a familiar form. Words, at first, are meaningless and evoke no change in the behav-

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ior of the ape. One can sit down in a nice pleasant location outdoors and comment on the flowers and the fruits that are all about, and the young ape merely wanders about noting only whether the intonation is soothing and pleasant or sharp. Nothing that is said alters the motion of the ape's exploration. However, as speech sounds become discriminated, attention begins to differentiate between utterances that are directed to the ape and utterances that are directed to others. This is apparent because utterances that are directed to the ape generally elicit fleeting eye contact toward the speaker, and those that are directed toward others often result in a brief visual fixation on the other party. The same sort of change can also be seen in young children and even perhaps in some pets.

After the initial orientation has permitted some words and/or phrases to be dissected from the speech stream, one begins to notice visual orientation toward an object when it is mentioned or shortly thereafter. For example, if Kanzi is walking near onions and he hears, "Oh look, there are some onions by Kanzi," he is likely to glance about himself, though he may not actually touch the onions. Once a word like "onions" can be pulled from the speech stream, the question arises as to how it is that Kanzi might even be able to realize that it could apply to onions, as opposed to all the other plants around him, the smell of the ground, the color of the sky, and so on.

The determination of the referent happens slowly across time, not on any one occasion. It happens because Kanzi hears a word that he can recognize in many different contexts. "Onion" is said many times, generally in a different physical setting and in a differential sentential context each time. Thus Kanzi could hear "Let's eat onions" (while someone else is eating an onion), "Put the onions in the backpack" (while someone holds a backpack open toward him after placing some onions in his hands), "Don't eat those onions" (after someone takes onions away from him that are for Panbanisha), "Let's look for onions" (while walking in the forest), and so on. Once the sound for onions is identified, then hearing it in many different contexts permits Kanzi to single out the common element of those different contexts, which happens to be the object onions. It is through this comparison and contrast across many different instances that some sort of "meaning apart from context" emerges. It can be said to be apart from the context, however, only in the sense that it is a common element of many contexts and, as such, comes to have its own "identity" different from the contexts in which it is encountered (Savage-Rumbaugh 1991).

This "identity" cannot be the same for each person, although for members of a common culture it will be similar. And for objects that are concrete, the overlap between individuals using the language will be high. Whenever the word is used in the future, it will be employed in a way that embodies some commonality that is a portion of the previous experience associated with that word. It is this process that is at the heart of metaphor and poetry as well. Thus a word like "fish" can become associated with the actual object as well as with the process of obtaining that object. The term "going fishing," once associated with that process, will come to mind whenever the behaviors that are linked to fishing come to mind. In part, the act of fishing implies an attempt to "catch" something, so it can convey this idea in a situation that is quite unlike that of fishing. Yet both the listener and the

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speaker of a common language will, at once, recognize this similarity, and the listener will perceive the intention of the speaker as he suggests "going fishing," even though this phrase has nothing to do with actual fish.

The same sort of process occurs when a word is learned that has no concrete external referent—such as "sorry." How does an ape come to feel contrition, and what makes him or her feel this way? Words like "sorry" occur in many different contexts as well; however, the utterances that contain them are generally of a more limited type than the utterances that contain a word like "fishing." One can hear utterances like " I am sorry," "He was sorry," "Are you sorry?" "You should be sorry," and even things like "It was a sorry sight," but one rarely hears sorry used as metaphor. Indeed, it is hard to use words that indicate any sort of internal state in a metaphorical way. Words that refer to internal physical states can never have a common referent in the sense that "fish" can have, since one person's internal state is not generally identical with anyone else's. Indeed, we have no way of knowing if it is ever like anyone else's nor is there any method of verifying that someone is actually in possession of such an internal state, other than by observing their external behavior. To use a word like "sorry" is to assume that the state that you are now experiencing is something like the state that others experienced when they used that word. Of course, whatever state it was that they experienced, you did not yourself experience, you only interpreted it. Thus, your use of the term could, in fact, be related to a quite different internal state. This is especially clear if the party claiming to be "sorry" happens to be an ape.

We are then forced to ask, can an ape really *be* sorry? But this question fools us, for it has no more meaning when applied to an ape than when applied to a human being. To *be* sorry is to equate some current state of one's own that is deserving of expression (the sorry state) with some state previously observed by another. To the degree that a speaker elects to make that equation (an equation, that is, between a current and past state)—she specifies the meaning of sorry for that individual. By social convention, certain behaviors that are different from those that occurred before the expression of the state of "sorry," may be required, before the acceptance of the expression of such a state as "sorry" is granted as valid by the recipient. The assumption is that because the execution of behaviors after uttering "sorry" differs from the behaviors emitted before, the change in behavior has been effected by some intervening mental state, expressed as "sorrow." The fact that we can never know that state on the part of another does not prevent us from learning when to use words like "sorry." We learn to utter them when we have behaved in a manner that is objected to by others. Saying "I am sorry" tends to reduce the likelihood that we will be the recipient of undesirable actions on the part of someone else, though this may not be our only goal in regretting our past actions.

Language, being what it is, can permit us to ask questions such as "Was he *really* sorry?" "Am I truly sorry?" "Why am I sorry?" Questions regarding the "real" mental state of self and others form the substance of clinical psychology. The difficulty with them is that such questions have "face validity." That is to say, given our understanding of words and grammar, such questions appear to us to be valid constructions, and if they are linguistically valid we often feel compelled to

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respond to them. Yet, except in a case where someone is intentionally misrepresenting the state of being sorry, there is clearly no more adequate means of determining if someone is "really sorry" than there is of determining whether they are "simply saying they are sorry."

Nonetheless, the fact that we can linguistically construct and contrast a state like "really sorry" with one like "just saying you're sorry" causes us to search for some means of verifying the one state as being different from the other. This state of affairs also has the unintended effect of implying that the state of being just "sorry" is not a "true" state. When the question is applied to one's self—that is, when one asks oneself "Am I truly sorry, or did I just think I was sorry"—the problem becomes multiplied and can extend one into the realm of inaction, since it can cause one to conclude that one is no longer able to monitor or evaluate one's own "mental state." Just as one can never experience the mental state of another, and thus can never know in a direct sense the state others express as "being sorry," one cannot make a judgement about one's own judgement of the existence of a state. To attempt to repeatedly do so leads one into a realm of self-doubt from which there is no clear return.

So how can an ape learn to be sorry? Certainly, a concept such as sorry entails the assumption that one is somehow aware of one's past actions, the effects of those actions on another, and the current desire to somehow absolve the effect by acting (or speaking) in a manner that brings that awareness to the behavioral foreground where it has implications for future actions. Apes are capable of forming such complex concepts and expressing them to one another through bodily postures and facial expressions. The former view of such expression has been that they are "innate" expressions, elicited by the actions of another, with no real cognizance of the "meaning" that is packed in a similar action or the utterance of a phrase such as "I'm sorry" by a person.

There seems to be some irony in the fact that when we attempt to determine if a person is really sorry, we try to look at her behavior, to see if she acts like she is sorry. If so, we are much more likely to credit her with such an internal state. In contrast, if a bonobo such as Kanzi behaves as though he is sorry, the inclination has been to label such behavior "instinctive." The use of such a label implies that Kanzi is not really aware of his past actions and thus can have no true desire to absolve himself of the effect that those actions entailed. Thus the very behavior that would define the actions of a human being as being "really sorry" (emotional facial expressions and postures) as opposed to simply claiming to be sorry, are, when seen in an ape, categorized as instinctive.

Slowly but surely, it is possible to begin to see that a great problem lies in our misleading use of terms such as "instinctive" and "innate." Whenever this term is applied to a behavior that exists in an ape, we can often find a nearly identical behavior in human beings that is not termed "innate." It is presumed that such actions are not "innate" in humans because they can be linguistically encoded and therefore cannot be simple responses to stimuli at hand. That is, a human can not only act sorry, he can say "I am sorry."

Consequently, there exist two completely different sets of terms for behaviors that are nearly identical in form and function between ourselves and apes. One

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set of terms (reserved for humans) presumes that awareness and intentionality underlie the behavior and that behavior is taken at face value as a validator of language expressions regarding the behavior. The other set of terms presumes that this not the case and these behaviors cannot be taken as equivalent to communication with awareness.

Yet we see that an ape such as Washoe or Kanzi can easily express a concept such as "I'm sorry" at both the behavioral and linguistic level. Should we then assume that they are aware of what they are doing when they say "I'm sorry" but not aware of what they are doing when they then proceed to act as though they are sorry? This makes little sense. Yet if they are aware of both the intent of the utterance and the intent of the action, and we can use their action to validate their utterance, just as is the case for human beings, what then is the case for apes who did not learn to utter "I'm sorry" but nevertheless express their sorrow by their actions? Must we continue to hold that they are only responding to an innate stimulus? To do so would seem odd, since it was, in part, through hearing his behavior characterized as "Kanzi is sorry" that Kanzi came to learn how it was that we employed the word "sorry." It was he who linked words to his actions and to what he was feeling, but to do so, he had to have experienced some awareness of what those past actions were and the nature of his present feeling. How can it be that it was language that permitted this to happen, since it is required to happen before the word "sorry" can be acquired?

The Achievement of Meaning Unbuttoned: The Emergence of the Social Contract

Certainly there is something extraordinarily incongruous in our rejection of the assignment of "semantic meaning" to the actions of wild apes with our own insistence on the exhibition of similar actions in other humans to verify meaning. We need to set aside this one-sided view of language and look at the behaviors of apes through the same lens through which we view ourselves. Is it possible to do so without committing the sin of "anthropomorphism?" Won't we see human thoughts, feelings, and mental states that are, in fact, not there? Of course we might. Certainly when we view the behaviors of other human beings, we sometimes see thoughts, feelings, and mental states that are not there. We do not always interpret the behaviors of others adequately, and there are vast differences among people in their skills of social interpretation.

We have devised scientific methods that reduce the probability that what is read in the behavior of others is indeed a product of our minds and not theirs. Such techniques include the use of multiple observers, repeated observations, and categorization of behaviors according to functional criteria. Yet even multiple observers and repeated observations cannot assure that what we record is completly free from "observer biasis." No technique is completely value free. The observer always has some effect on the data. But this is true in physics as well as in behavior.

When we adopt the alternative of studying animal behavior as though it cannot contain the same sorts of "mental state" variables as human behavior, we are,

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in essence, asserting that the very behaviors we depend on to validate our own "mental states" (facial expressions, postures, etc.) cannot possibly be taken as evidence of "mental states" in animals. Any such proposition lacks face validity at best and should require some proof. What evidence is there that an ape who behaves as though she is very sorry is not, in fact, experiencing the mental state of "being sorry"? Since we cannot directly know the mental state of another individual, there can be no such evidence.

It is true that PET scans can now depict a color picture of a "sad" thought, and some take this fact as direct evidence for the existence of the mental state of sadness. But one must recognize that a picture of the state of the brain during what we label "sadness" is no more revealing than a picture of the face during what we label "sadness." Each is a physical manifestation of an experienced state. Neither is uniquely closer to the actual "experience" than the other. The only difference is that others can "read" the face, while they do not normally have access to the brain patterns.

What would our science of animal behavior be like if we were to take the behavior of animals as intentionally communicative? How would it change the way we study them, and what we could we learn about them that we cannot learn otherwise? The first thing such an approach would offer is the seeking of a different sort of criterion for "explaining action." We would quickly find ourselves asking, "Why is it that a certain individual has elected to behave in a particular way?" Saying that it was the result of a "successful evolutionary strategy" would not seem entirely satisfactory, just as it does not seem an entirely satisfactory explanation of human behavior. For example, very different interpretations of bonobo social behavior may emerge from an "evolutionary strategy" explanation versus an "intentional stance" explanation, as follows.

Bonobos travel together from one feeding site to the next as a group. Fruit resources are generally scarce and widely dispersed. It is not possible to go on a random walk through the forest and find enough ripe food for a group of bonobos. They must have an extensive knowledge of the forest and its fruiting patterns. Once a decision is made to leave one fruiting resource and to travel to another, the entire group walks on the ground until they reach the new resource. If their judgment is bad and they have arrived before the fruit is ripe, they will have wasted much energy and may be far from another potential resource, as they often must travel for as long as two to three hours between fruiting areas. Bonobos rarely travel alone, and given the predators in their habitat, it is not likley that a single bonobo would long survive.

According to the conventional wisdom, bonobos are noted for having a social structure very unusual among apes. They are said to be the only ape species in which females are clearly dominant over males (Kano 1992). In fact, in the best-studied population, the dominant animal is said to be a female, who "rules" with the assistance of her son. Sons are said to stay near to their mothers and to support them for life, while daughters move to other groups. Because bonobo females engage in what has been called "G-G rubbing," or bouts of vigorous genito-genital contact, the bonobos are thought to be a rather divergent category of ape in which females have banded together, through sex, to wrest political control of the

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group from males (Wrangham in press). Evidence for the conclusion that females are indeed dominant over males is collected on the basis of determining who displaces whom at feeding sites and who it is that is first permitted to take sugar cane at feeding sites.

By asking questions such as "Who is the first individual to take sugar cane" and by pairing this information with the assumption that all individuals want sugar cane badly and that the animal who takes sugar cane first is politically the most powerful animal in the group, one arrives at a characterization of social structure such as that as just described. However, it is clear that if we were watching human beings enter a cafeteria, we could conclude very little regarding the structure of human groups by looking at who was the first one to take the food. There are all sorts of "social niceties" about offering food to others first. Any means of data collection that focused on "what happened" rather than "why it happened," from the perspective of the party who is producing the action, would come up with an inappropriate snapshot of human behavior.

So what if, instead of assuming that dominant animals will feed first, we were to ask questions like: Does a male move away when a female approaches? If so, does she do anything to scare him away? Does he want to eat sugar cane? Does she tell him that he cannot do so? Do males ever ask permission of females to take some sugar cane? Why do males stay with females and constantly display close and affectionate bonds if females displace them from food resources? Since bonobo males are larger than females, why do they permit females to be dominant? If G-G rubbing is used to establish female alliances that lead to female dominance, why don't males use homosexual behavior to a similar end to ensure male dominance? Male-male copulation without intromission occurs regularly; thus, it would seem that the males have a behavior pattern that ought to link them together just as do the females.

Questions about why something works one way and not another are rarely addressed by evolutionary biologists. Their goal is to determine why nature arranged things as she did, not why she could not have just as easily managed to arrange them in quite a different fashion. Whenever it is credible to state that a given behavior may increase "reproductive fitness," it is assumed that the behavior has been sufficiently explained. Such accounts of behavior stress that the unit of selection is the individual, and that each individual attempts, by maximizing his or her own fitness, to leave the maximum number of offspring. Because individuals are related and share a genetic heritage, assisting one's kin also increases an individual's inclusive fitness and thus an individual may in some cases benefit by ensuring the survival of his or her siblings. However, the idea that an individual may evolve strategies that act in the interests of his group is generally discredited on the basis of the fact that it is individuals, rather than groups, that reproduce. Thus, each indivdual is seen as existing in a state of rather constant competition with other group members. Mates, food, and other resources are viewed as contested items. Given this perspective, it seemed reasonable to assume that any individual in a bonobo group would attempt to gain preferential acess to a food resource if possible.

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We might explain much of human behavior in the same manner, and some have tried. However, we also know that there are many solutions to the question of how to construct a society that is capable of producing and rearing babies. There are also many ways to describe the roles of given individuals within a society and many ways to determine who is "dominant." However, if you were to question most human beings about why they behaved in a particular manner on a particular occasion, their answer probably would have little to do with leaving the maximum number of offspring. It is also likely that they would not equate dominance with their ability to leave behind the maximum number of offspring.

Of course, evolutionary theory tells us that we do not have to understand the driving forces behind our actions in order to behave in a manner that is consistent with these forces. Such, we are often told, is the difference between distal and proximal causation. There need be no relationship between why a person thinks that he is engaging in a particular action and why he is "really" engaging in it. Of course, such an argument can be shown to have "face validity," in the sense that people often offer explanations of their own behavior that seem inconsistent at best. Thus, we accept the fact that it is legitimate to discount these explanations in our search for deeper and grander explanations, ones that are said to be based on a true understanding of the underlying variables, rather than those that "appear" to control a person's actions.

The trouble with accounts that emphasize the distinction between distal and proximal causes of behavior is that these two kinds of causes must, at some point, overlap. If not, then the distal causes cannot be said to actually operate. Distal and proximal causes may look very different because they operate on different time scales, one across generations and the other within a given life span. Still, since proximal decisions lead to the distal outcomes, there is no other option; so at some point proximal causes must act in a manner that permits the distal "effects" to manifest themselves. Thus, whatever an organism's proximal reason for behaving in a certain manner may be, that reason must produce the same outcome as would occur if distal causes were driving the behavior. For this reason the proximal causes are critical, and it becomes important to determine, from the perspective of the organism making proximal decisions, why those decision are made as they are.

To return to the example of the bonobos—why do females displace males at sugar cane feeding sites? If females are always the first to eat, what other explanation could there be? On what basis can we assume that the males would prefer to be the first to eat the sugar cane and that they would do so if they were not prevented by the females? Are there other behaviors exhibited by males that suggest that they are submissive to females? Do males keep their eye on the sugar cane while the females are eating? Do they ever start to eat but move away if a female comes over to them? Do they ever try to challenge younger females? Do they scream or appear to show some other sort of consternation if a female approaches while they are eating sugar cane?

Strangely enough, the answer to all of these questions appears to be no. By observing videotaped examples of what has been termed female displacement of

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males during sugar cane provisioning, the perspective of the male can be addressed more definitively. We do not have to limit ourselves to the simple fact that females take the sugar cane first. We can ask *how* they do this and *how* the males react to it.

During a typical provisioning session, the sugar cane is cut and laid out in sticks by trackers. Once the bonobos have arrived at the feeding site, they can observe the reprovisioning process while remaining from five to ten feet back as the trackers chop up and lay out the sugar cane. As soon as the trackers are done, the female bonobos rush in and begin gathering as many sticks as they can hold and carry away. When the females have all they can carry, they rush to the perimeter of the feeding area, or into the forest to consume the sugar cane at their leisure. The males may follow the females into the center within a few minutes, or they may wait and go in after the females have retreated to the periphery.

Analysis of thirty-one cases of filmed sugar cane provisioning indicated that females took sugar cane and left before males entered the provisioning area in 10 instances. In all remaining cases, females entered first and began taking sugar cane, but males entered shortly thereafter and took sugar cane side by side with the females. When females and males took sugar cane side by side, females did not threaten or displace males. Aggressive actions by males toward females was equally rare. In only two instances did an adult male charge an adult female. These two instances occurred after the females themselves engaged in a fight on entering the provisioning area, and the charges appeared to be designed to mildly discipline the females.

During the filmed bouts, there were as many as six adult females and their offspring and four adult males in the center of the clearing at once. All ten individuals picked up sugar cane sticks and tucked them under their arms as rapidly as possible. Since the sugar cane was left in an area of about fifteen square feet, all ten indivduals were close together and rushed about rapidly to grab as many choice sticks as they could. Not once was a conflict observed over who could take specific pieces of sugar cane. Their behavior was very well coordinated so that they almost never started to grab the same piece. Even when they did, one of the them simply let the other have it and grabbed a nearby piece without contest.

The only observed dominance contests were those which ocurred between females prior to entering the feeding area, or immediately after entering. Females and associated offspring always entered first, and there appeared to be some order regarding which female was permitted to be in the front of the group of females. Males entered later, with no obvious order among them. Males generally entered slowly, while the females raced in. Older juvenile and adolescent males always entered last and often not at all.

The males monitored the perimeter carefully while the females were busy taking sugar cane from the center of the site. If a human started to approach the site, males often displayed in his direction, apparently to keep him from getting too close to the females. On two occasions, males made clear hand gestures to the females waiting at the periphery of the clearing; the gestures seemed to signal that it was time for the females to enter. In response to these gestures, the females at once rushed to the center and began picking up sugar cane.

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Males occasionally displayed toward females at the feeding site by dragging branches toward them and sometimes by flailing branches at them. However, these displays occurred after the sugar cane had been obtained. Such branch-dragging displays never caused females to run away or to stop eating their sugar cane. Generally females leaned over or moved a few feet away from a displaying male; most often they completely ignored him. The displays toward females seemed designed to get attention and were sometimes followed by copulation and sometimes followed by moving off into the forest after a male dragged branches into the forest. The only male branch-dragging display directed toward females during the procuring of sugar cane occurred after a dispute had erupted between females about the order of female entrance into the center clearing.

Oftentimes, prior to the approach of the females, the males would charge through the center of the clearing dragging large branches, particularly as the trackers who had chopped up the sugar cane began to move away. Vigorous branch-dragging by the males toward the trackers appeared to occur when the trackers were nearly finished cutting up sugar cane, as well as when all the sugar cane had been consumed and the trackers were nearby with additional sugar cane not yet chopped.

Thus it could be seen that it was possible for males to display at females in the feeding area; however, never when they did so did they then appear to be contesting acess to sugar cane. Instead, they focused their attention on the periphery of the feeding site, the trackers, or the forest beyond the feeding site. Sometimes they even repeatedly dragged branches to the edge of the feeding site and beyond into the forest. In such instances, all of which occurred after much sugar cane had been consumed, the male appeared to be attempting to get the females to travel to another location that lay in the direction that they had dragged their branches.

From these observations we can conclude that if females do indeed displace males, it must be on the basis of a prior understanding, that females *always* get to take sugar cane first if they so desire. It is *not* the case that males can be observed attempting to take sugar cane and are prevented from doing so by the females during provisioning. The second thing that we can conclude is that no male seems timid or hesitant around the females. Adult males do not flee when females approach, nor do they ever try to steal food at the sugar cane site when females are not looking. In short, males do not behave around females as though they are in submission and/or fearful.

Could these behavioral patterns simply reflect the "nature" of the bonobo male? This seems not to be the case, since adolescent males do behave in a submissive manner; they show overt deference to adult males. Adolescent males also tried to steal pieces of sugar cane when either females or males were not looking—something adult males never did. Moreover, adult males quickly and firmly disciplined adolescent males who tried to take sugar cane before the females had had their share. Such disciplinary action by adult males occured during one-third of the observed bouts. Thus, we are left with the puzzling observation that, in a society that is supposed to be dominated by females, males never appear to be frightened by females and, in addition, they act toward younger males in a manner which enforces the rule that females are the first to enter feeding sites.

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Why should bonobo males discipline adolescent males who attempt to take food before the females had eaten? Is it possible that bonobos have a social rule about when the sexes eat? Could this be why females are never observed to threaten or remind males to stay away from the food? Could this be why males are never observed to steal food when females are not looking? Certainly, if there is a rule about when the sexes eat, it would be expected that more is going on than simply a female grabbing all the food for herself. If there is a rule regarding the order of eating, it should be the case that both sexes are aware of the rule, that both agree to it and abide by it, and that it is beneficial to both in some manner. One would also predict that if there is such a rule, then we should find that females, who are to eat first, leave some food for males, rather than take it all. If this were not the case, the rule would break down. Males would not follow the rule if they could not be assured of having food by waiting until the females had finished.

Of course, to propose that a nonhuman primate has a social rule is to raise many questions. How does such a rule arise, and how does it get communicated among the group? Do older individuals teach younger individuals the rule, as when the adult males disciplined the adolescent males for taking food before the females had eaten? And how can there be a rule without a language—without the rule ever being verbalized, how can it arise? And if there is a rule that is understood by all group members, how are transgressions of the rule handled? Can any member of the group punish any other member of the group for violating the rule, or does this task fall only to certain group members, and if so, how would such members know that this was their role? If not, what would stop the entire group from mobbing any individual who broke a rule? And how much punishment should an individual receive for breaking a rule? Should it fit the crime, so to speak—in degree, if not in kind?

In one case, when an older juvenile male tried to take food before the females had eaten, he was punished by a single adult male who proceeded to sit on him for several minutes before letting him up. Afterward the young male made profuse apologetic gestures, which were ignored by the adult male. The young male not only made these apologetic gestures toward the adult male, but toward other group members as well. It is noteworthy that the punished juvenile male was *not* trying to steal food from the adult male who punished him, but was only trying to enter the feeding area before the other males had begun to do so themselves.

It is equally intriguing that the young male apologized for his indiscretions to members of the group other than the male who had punished him. Why would a young male have been punished by an adult male when he was not trying to take food from that male? Why would the young male have made appeasing gestures to many other group members after having been punished for this action? Such actions make sense only in the context of the operation of social rules or principles. They do not make sense from a simple perspective of "dominance relations."

The analysis of the filmed provisioning bouts provided evidence supporting the existence of a societal rule that specifies when the sexes feed. Moreover, these observations suggested that all individuals in the social group were aware of this rule, and that they sought to behave in a manner that supported the rule and made over-enforcement a relatively infrequent event. Rather than being intimidated and/

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or displaced by females, it appeared that the males were actually clearing the feeding site of people and making certain that it was safe for the females to enter. They were then monitoring the perimeter of the cleared feeding site while the females obtained their share of the food and carried it away. The males then helped themselves to the food that was always left behind.

Why should males cooperate to the benefit of females? Why should they behave in a manner that ensures that key group members have the greatest access to food? Rarely are bonobos found apart from their group; to be a bonobo is to exist within a group of bonobos. Consequently, behaviors that benefit the individual, at the expense of others in the group, decrease the integrity of the group and eventually put the survival of the individual at risk. Given the inevitable tension between the need to cooperate with other group members and the need to achieve access to resources for oneself, the emergence of social rules would seem to be an optimal solution. Social rules enable each individual to behave in tense social situations according to norms. As long as the norms that evolve ensure that each individual has access to prized resources in a manner that manages to preserve the integrity of the group, it is to an individual's advantage to learn and follow those social norms. Thus, in the bonobo, we apparently find rules about who enters feeding areas and when. We see rules about the roles of males and females during feeding. We see these rules being tested by adolescents and juveniles but not by adults. We find that these rules have specific requirements not about individual pieces of food but rather about the circumstances under which individuals are granted access to food resources.

Which interpretation of the behavior of male bonobos is accurate? Are they submissive to females, who have evolved a stategy of co-opting sexual behavior to give them dominance over males in the eternal battle of the sexes? Or are males cooperating to make certain that the most vulnerable and reproductively important members of the group (females and their young offspring) get priority access to food under protected conditions? Certainly more observations are warranted. What is important here is to recall that an alternative interpretation of behavior came about because of the raising of questions about "intentions." There was no evidence that females intended to keep males from taking sugar cane. There was evidence that the actual taking of sugar cane is a very coordinated affair, which may be guided by social norms agreed to by all parties.

The New Lens: Moving beyond Speciesism

This example serves to illustrate how a radically different level of complexity can emerge from studies of behavior if a few simple assumptions are made regarding the reasons for individual actions. When one determines, a priori, that all individual actions in animals are programmed by the ultimate distal cause of "leaving more offspring," all behavior is then forced through the narrow lens of the "individual reproductive competition hypothesis," and the acts of each individual are seen as being only in the service of its own immediate procreative interest. Each individual is viewed as a selfish creature or at best a creature whose only drive is

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to protect itself and closely related kin. Looking through this lens, one cannot conceive of questions regarding the kinds of social rules that might guide the behavior of groups.

Which account is closer to the truth, and how can we be certain? Of course, we can never enter the mind of an ape and ascertain whether apes have social rules that operate in the way that they appear to us to do. However, we also cannot enter the mind of a human being to ascertain that he or she perceives the rules of society in the same way that we do. The most we can do is to ask them—and to that end we must use language. Language itself provides us with an answer that can be seen as coming through a prism. For language usage—what you say, to whom you say it, and how you put it—are all facets of behavior that are themselves the function of social rules.

Language is a funny thing. We do not think of it as behavior, yet at heart that is all it really is—another form of behavior; a form that we use to characterize other parts of behavior, but a form that cannot be divorced from the rest of behavior.

Concepts that take on the garb of language seem to acquire a life of their own; thus we talk about ideas, we talk about concepts, we talk about trust, we talk about perception, we talk about learning, we talk about memory, we talk about declarative memory, we talk about procedural memory, and we talk about social rules, among many other things. But we often forget that these things are "talk." We forget that it is *we* who have labeled some behaviors memory, others learning, and others perception. We perceive some patterns of behavior that we can characterize as having common elements, and we give those patterns a name. Just as we call a boat the *Annabel Lee*, we call some patterns of behavior by a name (autism, procedural memory, etc.). We come to believe then that because these patterns have a name, they are more than behaviors. We often conclude they represent actual physical brain structures. Without these structures, we assume, we would be unable to generate the patterns of action to which we have assigned labels. Thus, if one lacked a Broca's area, it was said, one would be incapable of articulate speech. It was then found that even children who lacked the complete left hemisphere could produce normal language. Such findings reveal that the structure we perceive in language cannot be located in the brain. It exists in the patterning of behavior, because we need it. We generate these structural speech patterns just as bonobos generate social rules or expected patterns of group behavior. There is nothing special about language, other than what it makes of itself.

Language is a funny thing. It permits us to think that we know things that indeed we do not know. It permits us to talk about things rather than to do them and to think we have actually done something by talking rather than by acting. It permits us to think that by talking in unison, we can come to act in unison—forgetting that the more feeble the link between word and deed the less likely words are to alter deeds. Should we wish to act in unison, it is far better that we sing than that we speak.

Language is a funny thing. It permits us to think that other species are not able to communicate the purposes or intentions of their actions to one another, nor to

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coordinate their behaviors, nor to plan their actions. It permits us to think this because it permits us to avoid hearing the kind of talking that other species are doing.

Language is a funny thing. It enables man to put himself above the "beasts" simply by the act of saying to himself, "God gave man dominion over all the creatures that walk the land and all the fish that swim in the sea."

What if we never said that to ourselves?

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