

**Abstract** When human cultures merge, each takes on characteristics of the other and a completely new culture may emerge. Can a similar kind of phenomenon occur when the ways of being, doing, thinking, speaking and acting meld between two closely related hominid species, like *Pan* and *Homo*? We point to a new kind of group process, termed a *Pan/Homo* culture, and characterized by changes in the behavior of each species. A common emic perspective has developed between members of different species as they have come to share a common culture, but not a common biology. Their long-term shared experiences lend the force of credibility and meaningfulness to the communications regarding goals, plans and intentions. These expressions, inherently functional and meaningful within the joint subjective experiences of the members of the culture, nonetheless fail to meet standards of basic science, which demand detachment and disembodiment of communication. Because of this failure, accurate emic accounts of experiences within the culture are categorized as 'anecdotal'. By contrast, identical emic descriptions of experiences in 'human-only' cultures carry the force of law when given under oath. Accurate emic descriptions of communication processes—using examples of spontaneous *Pan/Homo* dialogues—are presented to reveal this bias. These dialogues illustrate the way in which empiricism acts to protect established modes of thought from new frameworks that pose a threat to its established interpretations of extant data. They also illustrate the cultural processes of shared knowledge, shared memory and joint subjective perceptions of reality that structure true symbolic communicative interchange and render it impervious to etic understanding.

**Key Words** communication, emergence of culture, novelty, sign systems

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## Linguistic, Cultural and Cognitive Capacities of Bonobos (*Pan paniscus*)

### Speciesism

Gannon, Holloway and Broadfield (1997) recently demonstrated that chimpanzee brains display a morphological asymmetry of the planum

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temporale similar to that of *Homo sapiens*. In 17 of 18 chimpanzee brains, the left planum temporale was found to be larger than the right. These differences were apparent on gross visual inspection. This finding was surprising because the asymmetry was obvious and should have been detected long ago. The demonstration of a clear and easily observable asymmetry in the region of the planum temporale illustrated how the prevailing trend toward considering language exclusively as a property of the human species has prejudiced scientists against the collection of readily obtainable data which do not fit their predictions.

There was a time when anthropologists looked at the skulls of African races and concluded that they were more primitive than those of the Caucasian race—a fact that supported the sociopolitical climate of the day. There was also a time when the languages of hunting and gathering aboriginal peoples were considered primitive and lacking in the capacity to express abstract concepts. And there was a time when tribes of human pygmies were put on display at the World Fair as examples of the ‘ancestors’ of modern man—a view which supported the racist position of many powerful anthropologists (Bradford & Blume, 1992). We now recognize that each of these views is both morally offensive and incorrect. Science is our attempt to be objective, to collect facts and to evaluate those facts from an unbiased perspective; but what seems unbiased in one place and time may be found wanting in another.

The era of discrimination is not over; it has only been extended to our kindred species, the apes. Apes are said to ‘vocalize’; we humans are said to ‘speak’. Ape sounds are said to be linked to ‘emotional content’, while ours are said to be linked to ‘semantic content’ (Bickerton, 1990; Liberman, 1991; Ristau, 1991). This dichotomy is not only homocentric in the extreme; it overlooks the fact that semanticity does not need to be free of emotion to function referentially (Deacon, 1997). Numerous volumes are now devoted to the origins of mind, language, culture and consciousness—all offering multiple speculations as to how and why *Homo* alone is thought to have evolved the gift of ‘real’ symbolic capacity, a gift that supposedly freed us from the need to respond to every event that occurred around us and permitted us to think, to evolve rational choice and consequently free will (Donald, 1991; Mithen 1996; Shore, 1996). Yet this view of ourselves is, like all others we have produced, a cultural construction. It is our ‘current scientific’ origin myth so to speak, and the ‘truth’ that it conveys regarding our utter uniqueness among living beings is but a cultural truth. There are no data which prove that other apes are unable to communicate linguistically.

## **Linguistic Capacities of Apes**

When apes are reared around human caretakers who speak English and point to printed symbols while talking, they spontaneously learn to use these printed symbols for communicative purposes (Savage-Rumbaugh, McDonald, Sevcik, Hopkins, & Rubert, 1986). The enormity of this accomplishment has not been widely recognized because the difficulty of the task is not generally understood. Learning to 'speak' through the keyboard is the equivalent of learning to read in order to be able to talk. Until one attempts to use the keyboard in real communicative situations, one has little idea of how much concentration is required.

At the Language Research Center, spontaneous emergence of language comprehension and production has been documented in four separate apes, three bonobos and one chimpanzee (Savage-Rumbaugh, 1997). All have acquired comprehension vocabularies in excess of 500 words and productive vocabularies in excess of 150 words. Because apes must employ a symbol board instead of their natural vocalizations, their productive utterances are much shorter and simpler than the English syntactical constructions they comprehend. Nonetheless their productions follow grammatical rules that reflect English word order (Savage-Rumbaugh et al., 1986, 1993). When symbols are combined with gestures, order is still observed in that gesture is placed last, a convention of the apes' own invention (Greenfield & Savage-Rumbaugh, 1990). Their comprehension skill extends to the conversational level and includes understanding of narrative dialogue (see Appendix).

In addition to showing sensitivity to the role of word order in the English language, the apes have displayed an understanding of the possessive structure, adjectival modifiers, anaphoric pronouns and clausal modifiers. This comprehension has been documented under conditions that require syntactical processing. For example, when Kanzi, a bonobo, was asked to 'Go get the ball that is in the bedroom', a ball (along with many other objects) was in front of him, as well as in the bedroom. Had Kanzi understood only the words 'ball' and 'bedroom', he might have given the experimenter any ball and then proceeded to go outdoors. Instead he brought the experimenter the one ball that was syntactically marked as residing in a specific location. Additionally, when given syntactically ambiguous sentences, such as 'Go outdoors and get the ball', Kanzi appropriately responded ambiguously as well. That is, sometimes he gave the experimenter the ball that was in front of him and then went

outdoors. But when the syntactical marking was clear, Kanzi's responses were equally clear.

Even sentences that employed syntax to request very unusual and unanticipated sentential interpretations were properly decoded. For example, a sentence such as 'Feed your ball some tomato' cannot be resolved into productive action through simple associative responses to words such as 'ball' and 'tomato'. In this case the word 'ball' was being applied, for the first time, to a pumpkin with a face carved into it. Having never observed anyone 'feed' a pumpkin or a ball, and having never heard anyone call a pumpkin a 'ball', meant that Kanzi not only had to understand that the syntax of the sentence required him to treat the pumpkin as an agent, but in order to do that, he also had to recognize that the word 'ball' was being applied to something that was clearly not a ball. Additionally, given that a pumpkin cannot actually eat a tomato, the actions carried out had to be 'pretend' rather than real. If this were an isolated 'anecdotal example', Kanzi's comprehension could perhaps be attributed to accident. But this example, along with many others, represents a large body of data in which each sentence given to Kanzi and each response was fully documented on tape. The context before, after and during each response is known—thus ruling out 'accidental correctness' as a responsible interpretation of the phenomenon.

Traditional linguistic analysis tends to overlook the enormous cognitive effort that every child must make to attempt to coordinate his or her interactions with others (Savage-Rumbaugh, Shanker, & Taylor, 1998). Too narrow a focus on syntax ignores the fact that the power of language lies in its capacity to provide information regarding the future actions and intentions of others. If a child does not, or cannot, process these cues, then he or she has no way of knowing what is going to happen next in the social realm. Every child must make a Herculean effort to integrate these sources of information in order to enter appropriately into the human cultural perception of reality, its flow of events and its narrative. To make this adjustment requires far more than a Language Acquisition Device (LAD) or even a Language Acquisition Support System (LASS). It requires the capacity to identify with the other. By coming to understand the perceptual flow of events in the same way as others and the narrative lens through which they are ordered, the words that others utter become interpretable and the structures they employ to order those words are learned as well.

Why should it be more difficult for the brain to acquire linguistic structures than it is to acquire forms of perceptual constancy as the body interacts with the physical world? The linguistic constancies we

call syntax are more realistically viewed as emergent phenomena of interacting with a social world that signals regularities of interaction through sound-based utterances than as prewired neuronal structures. Surely the interaction of all complex animal social systems needs the constant updating of referential rule-governed communications. How else could they work? While one, with difficulty, can imagine an individual ape or monkey or elephant or dolphin responding to events around it in a mechanistic 'instinctive manner', one cannot imagine an entire social system of such programmed creatures doing so. Even a single day of watching a group of monkeys interact is sufficient to counter the 'social clockwork' model. And the longer one watches and the more one identifies individuals within the group and develops a knowledge of the historicity of the social encounters, the more one realizes the uniqueness of each and every social interaction and the totally individualistic context in which it is placed. It is, at best, only global patterns that repeat themselves, never specific social events.

The global patterns however, if observed for a long enough period, take on a rhythmicity and rule-oriented character. They may be said to form the deeper structure of social interaction upon which the processes of referential communication and syntax overlay and ride.

### **Qualitative Description**

The capacity to decode syntactical utterances is built upon the substrate of a complex social understanding of the nature of interaction and the role of dialogue in the construction of social events. Kanzi and Panbanisha, another bonobo, could never have learned to decode sentences if they had not first developed a capacity to cognize social events in a manner that was similar to that of other members of their bi-cultural group. As an example of their capacity to engage appropriately the social nexus, Sue offers qualitative notes made as she worked with Panbanisha on a single day, notes which include her subjective reflections upon their comprehension and interpretations of complex events. Her reflections are not those that would or could be made by an unfamiliar observer. They are informed by, and can only be informed by, regular interaction with Panbanisha and knowledge of her personality, her preferences, and her general communicative competency. Does such interactive intimacy cloud her ability to discern Panbanisha's real competency? The answer to that question is determined by whether or not her interpretations of Panbanisha are functional ones in the encounter. In the domain of ongoing life events, communication must be functional. Participants, in order to establish a

cooperative working relationship, must forge a feasible assessment of one another's communications. Inefficient and ineffective communicative interactions lead to a closing down of the interactive web and a lack of cooperation. The more accurate the assessment, the easier the flow of interaction and the greater the degree of cooperation attained. What emerges is a culture of inter-species communication. It is comprised of a joint history, mutual knowledge of similarly interpreted events, joint understanding and engagement of facial expressions, gestures, glances, symbols and vocalizations woven into a functional communication matrix.

**Event #1: Asking Panbanisha's Assistance in a Work Activity She Does Not Normally Do**

After greeting Panbanisha, I commented to her that we need to take onions to Mari and that we need to hose out Mari's living area (Mari is an armless orang-utan who lives with Kanzi and Panbanisha.) Panbanisha looked at me, but did not reply. (Typically, Panbanisha is not asked to assist in cleaning Mari's cage, but on this occasion I was working by myself and there was no one else to assist.) Panbanisha continued to eat some onions that she had taken from the refrigerator and ignored my comments studiously. Though cleaning Mari's cage was not part of our normal daily activities, I believed Panbanisha understood what I had said, but was not excited about it. I inferred this more from the lack of expression on her face, or her studied indifference, than anything else she did.

Instead of accompanying me, Panbanisha walked over to the cabinet, put her hand on the juice-maker and looked directly at me with a questioning expression on her face. I understood her gesture to be a request to assist her making fresh fruit juice and replied that we could make juice later, after we finished hosing out the cages. In response to my comment, Panbanisha took her hand off the juicer and continued to munch on her onions. I interpreted this reaction to indicate that she understood that we were not going to make juice now and that she did not want to go back into the colony room with me. I repeated my request that we go and clean Mari's cage and again received no reaction or acknowledgment that I had even said anything. Panbanisha is much too large for me to pick up and take into the other room, and if she does not agree to go with me, there is nothing I can do. Fortunately, this rarely happens.

Seeing that Panbanisha was going to continue to ignore my request to go clean Mari's living quarters, I changed by mind and said to her, 'Well you can stay here while I go.' Immediately she turned, looked at

me, picked up her onions and strolled to door that led to the colony room and pointed to the lock. She thus revealed that she had understood what we were going to do, and that she also understood that the sentence ‘Well you can stay here while I go’ referred to my intent to go to the colony room without her and she did not want me to do that.

**Event #2: Giving Panbanisha a New Task That She Had Never Done Before—With the New Task Expressed Linguistically**

Before we entered the colony room I decided that I would think of a job for Panbanisha to do, so that she could feel that she had a purpose in going with me as well. I did not want her to spray the hose, which she sometimes did, because I needed to finish the job quickly. I also wanted to see if she could cooperate with a completely novel and complex request, encoded only linguistically. So I told her that she should ‘go around to the back of the cages and push the button to lock Mari’s tunnel door’. This was a most unusual request to make of Panbanisha. I knew that if she understood it, she would probably want to do it, since she had never been permitted to do so before. Generally she is not even permitted out of the cage while we are cleaning. However, she would regularly have seen Mari’s tunnel locked in this manner by other caretakers.

Panbanisha revealed that she understood, because as soon as I opened the colony-room door, instead of just walking around in the hall or playing with the hose as she would normally do, she went to the gate leading to the back, pointed to the lock and waited patiently for me to open it. When I opened it, she went directly to the back, climbed up the ladder so that she could reach the switch controlling Mari’s tunnel door, and flipped it upward, shutting off the electricity, so that Mari could not open the door.

I busied myself hosing out the cages. Panbanisha similarly occupied herself by taking the cold-water hose off the rack and turning it on. However, it did not have a spray attachment—something she pointed out to me, by getting my attention with her eyes and holding up the end of the hose toward me, to show me that the water was running out slowly. But at the time, I did not grasp why she was showing me her hose and simply commented to her that was fine that she had turned a hose on for her own use.

When I finished cleaning Mari’s cage, I asked Panbanisha to unlock her tunnel, assuming that since she understood about locking it, she could also assist me in unlocking it. Panbanisha looked at me and then looked away. She did not seem to want to comply with this request,

but I could not be certain; perhaps she did not understand the request. She then got the steam machine out of the hallway and began to pull it toward me, looking at me with a questioning expression. The steam machine is very large and heavy and not easily moved. She had to stand bi-pedally and pull very hard to move it. I assume that she has seen someone else use the steam machine and that she would now like to try steam cleaning. She apparently did not want to unlock the tunnel and let Mari in; instead she was trying to tell me that we should steam-clean Mari's cage.

I responded to this request by saying that I did not really know how to use the steam machine. In response to my statement, she looked at me, picked up the end of the hose and directed it to the place on the machine where there was a matching couple, apparently demonstrating how I should hook it together. I commented, 'Yes, I see that the hose could be attached there, but I really don't want to steam-clean.' She dropped the hose and then suggested that we go to the staff office by pointing to the staff office door and looking at me.

Since Panbanisha did not unlock Mari's tunnel, I could not be certain that she understood that request. However, when she is in the colony room, she often chases Mari proprietorially out of that cage, so it may have been that she simply did not want to let Mari in. In instances such as this, additional attempts are needed in different situations to determine which of the above interpretations, if either, is correct.

**Event #3: Asking To Watch Television and To Have Written Notes Read to Her. Helping to Unplug and Relocate the Television**

Just before we were ready to take the juice into Mari, Panbanisha found a small video 8 player. She carried it to me, put it on the floor by my feet, and looked at me. I asked, 'Do you want to watch TV?' and she vocalized 'uh huh'. I told her that we would watch TV after we took the juice to Mari. She indicated her agreement with a nod, and then she put the TV down and accompanied me back to the colony room. While I was sitting in front of Mari's cage, Panbanisha went down to the end of the alley where there was another TV on a cart. She tried to put a tape into the deck and turn it on. I guess she decided to just watch TV there, since sometimes it takes quite a while to get Mari to come in and eat. Seeing that she was trying to do this on her own, and knowing how difficult it was to get that television and deck to work properly, I asked, 'Would you like me to help you get that TV on?' She responded with a vocal 'uh huh', then unplugged the deck from that end of the alleyway and rolled it toward me. I walked down to help her saying 'I will roll it down in front of Mari's cage and we can watch it there'. She

responded by letting me push the cart while she went ahead to the front of Mari's cage and waited for me.

After we finish feeding Mari I asked Panbanisha if she would like to take the TV cart back into the group room with us. She vocalized 'uh huh' and then held the door open for me so that I could push the cart through. In the group room she watched TV and groomed, while I wrote notes. After a while she approached me and looked over my notes very carefully. She then took her index finger and rubbed it across the lines of writing, one at a time very gently, and looked at me. I didn't understand what she was asking at the time, but later I learned that she wanted me to read my notes to her. Another caretaker explained that she did so when Panbanisha similarly pointed to her notes and that Panbanisha was very pleased and listened intently.

Panbanisha can easily use the keyboard to request to watch television, but in this case she chose to bring me the television to indicate the same thing. I assumed it was because she wanted to watch tapes on that particular small television, which she verified in response to my question. Because she can reliably respond 'yes' and can reliably ignore me to indicate 'no', many aspects of our relationship can be negotiated simply through the use of appropriate questions on my part. However, this does not always work, as was the case when she pointed at my notes. We do not have a symbol for 'read' on the keyboard and I was unaware that others responded to this gesture on her part by reading their notes. This illustrates how a communicative history can have a specificity that does not always transcend situations. If Panbanisha could utter English words, she might have remembered that the other caretaker said, 'Oh do you want me to read?' and then said 'read'—but her vocal tract does not permit her to do so.

#### **Event #4: Thinking Ahead**

When we returned to the group room, Panbanisha sat down again in front of the TV set and I told her that I needed to use the restroom. We were watching a tape of two caretakers wearing masks and pretending to scare Kanzi and the other bonobos at the center. Panbanisha had requested that caretakers make such a video tape for her last October.

Panbanisha seemed to enjoy this tape, as she rarely took her eyes off the screen while it was playing. When it was over, I put in a tape of Amy, the gorilla in *Congo*, and Panbanisha lost interest quickly and went into the T-room, found her collar and brought it to me. I asked, 'Where are we going to go?' She answered 'House'. I said no, we could not go to the house today and asked, 'Is there anyplace else you would like to go?' She responded, 'Camper cabin'. Camper cabin is a location in the woods

that is on the way to the house and I suspected that her interest in going there might be a way of getting me to go close to the house.

I replied, 'Yes, we can go to camper cabin, but first we need to go the big cooler and get some food to bring back?' Panbanisha agreed, saying 'uh huh'. Then she went to the T-room, got out a small cooler for me to carry food in, and brought it to me. Panbanisha knows that each morning someone brings food to the group room and she knows that the large cooler is where food is stored. She also knows that when people bring food, they get quite a lot and that they always carry it in some sort of container. The fact that she would think to get a container for me was surprising, but it suggested that she understood what I intended to do and that she was thinking ahead about what we would need to transport the food. This kind of thinking ahead is often seen in the bonobos, but it is not fully developed. Thus while Panbanisha might indicate that we need a container, if she must carry it all the way to the cooler, she is likely to forget it as soon as she sees something interesting.

#### **Event #5: Using Lexigrams To Negotiate an Intention**

Outdoors, it was chilly and I thought Panbanisha would want to take the car. However, she walked right past it and headed toward the cooler. Fearing that she might get cold, I said, 'Let's go in the car. It's too cold.' Immediately she turned around, went to the car, opened the door and climbed in. As soon as I got into the car, she opened the keyboard and said 'house'—to again indicate that this should be our destination. I told her that we could not go inside the house today, but if she really really wanted to go there, perhaps we could go and stay outside and just look. She was silent and looked away. I asked her if she would like to do that, and she did not respond. It appeared to me that she understood this suggestion and did not like it. However, to make certain, I asked, 'Could you say "look" on the keyboard?' and I pointed to the 'look' lexigram in case she could not locate it. She again turned her head away, refusing to agree that it was OK to go the house and just 'look'. Realizing that this was her way of refusing to agree with my statement, I rephrased, asking: 'Well, could you just take your finger and point to the look lexigram anyway?' She looked at me with an exasperated expression, and pointed to the 'look' lexigram.

When we reached the point in the road where turning one direction would take us to camper cabin and continuing ahead would take us to the house, I asked if she wanted to continue her original plan of going to camper cabin. She looked over toward camper cabin, then replied 'house'. I agreed that we could go up and look at the house.

Panbanisha held to her original desire and refused to agree with my symbolically suggested modification of it. Since I was uncertain as to whether she rejected my modification or did not understand it, I offered an alternative way of phrasing the statement. Instead of 'look' being something that she might wish to do, I turned it into something that I was simply asking her to say. The fact that she complied with the latter, but not the former, suggested that she understood the difference between these two statements. Neither Kanzi nor Panbanisha elect to use the symbol 'no', though both use 'yes' frequently. This can make it difficult to differentiate between rejection and lack of comprehension. However, by rewording a question in different ways, it is often possible to determine which interpretation is correct.

**Event #6: Refusing To Carry out a 'Loud' Action, and Replying to Questions About an Unborn Baby**

We proceeded up the steep hill to the house and parked. I knew that Panbanisha was unhappy that she could not go in the house, so I decided to see if having some special food, or having the dogs visit us in the car, might be enjoyable for her. I asked, 'Do you want to have the dogs visit us?' but she refused to respond. She has enjoyed visiting with the dogs so many times and is generally so quick to ask for them that I knew she understood but wanted something else. So I asked, 'Would you like to have some food?' and she replied 'uh huh'. Often we go into the house and find food, but since we could not do so today I suggested, 'Why don't you honk the horn and get someone's attention? They might bring us some food.' I could not recall ever having asked her to honk the horn before and I was not sure if she knew the word 'horn' or not. She vocalized excitedly with happy sounds and said 'uh huh'. She seemed to understand that we might be able to get some food even if we could not go into the house, but she just looked at the horn and would not honk it. I repeated 'Please honk the horn' but she did not; she only looked at the horn and then gestured toward the house. I repeated the request three more times, saying it in different ways: 'Don't you want to make a noise to get someone? Try honking the horn.' I pointed to the horn and said, 'Here is the horn, just push it.' But she still would not honk the horn. It seemed to me that she understood what I was asking her to do but just would not do so. Finally, I asked, 'Do you want ME to honk the horn?' and she gestured toward the horn and replied 'eh huun'. I honked it and she stared directly at the door of the house, waiting for someone to come out. Panbanisha is nearly always very quiet. So I assumed that she surely could honk the horn but did not feel comfortable producing a sharp sudden noise.

After I honked the horn, she waited quietly. She did not ask for food, try to open the door, or ask again to go in the house. It seemed she knew that she did not need to insist on getting out of the car, as someone would hear us and come. I found her apparent comprehension of what was going to happen interesting because we had never 'honked' for someone to come to the car before. We had, however, often rung the doorbell and waited for caretakers to answer, and they sometimes brought us food on such occasions.

When someone finally opened the door, they were surprised to see us in the car and did not know what to do, so I gestured for them to come to the car. I then explained that Panbanisha was hoping that she could find some food in the house. The caretaker asked her what she wanted and she replied 'yogurt, jelly, [and] cereal'. He agreed to get those things. Then he decided to ask Panbanisha, who was pregnant for the first time, 'Panbanisha, where is your baby?' She smiled and pointed to her abdomen. Her reply was not a trick or a rehearsed event. Panbanisha had been told that she was pregnant and was going to have a baby. She had also been told that there was a baby in her tummy. But we had not queried her or encouraged her to respond to questions by pointing to her tummy. This was her own doing.

She has seen three siblings born and has heard us speak of the 'babies in her mother's tummy'. Thus she had reason to comprehend the relationship between these comments and the birth of a baby. Nonetheless, I recognized the difficulty in determining whether she understood that she was pregnant and anticipated that she would give birth. In contemplating how it is that we know a human mother really understands that she is pregnant on the first occasion, we have only her speech to go on—her answers to our questions—and this is all that we could ask of Panbanisha. When this question was repeated in other contexts, Panbanisha always responded by pointing to her abdomen. I was even more surprised when, on another occasion, she indicated that she recognized her baby on a sonographic display shortly before birth.

### **Qualitative Observations and Validity**

Qualitative description has rarely been part of the narrative of ape language research. It is now time to alter this. Sufficient information regarding apes' cultural habits in the wild and sufficient biological data regarding their relationship to ourselves have been obtained across the past two decades to warrant inclusion of narrative report and interview into the tool box of the ape language research effort. The questions of whether or not apes are aware of their communicative

intent and whether or not they have the capacity to formulate and understand novel ideas and communications have been answered with empirical data. What remains to be presented is a systematic qualitative narrative account of the social, cultural and political uses of dialogue across time. As this becomes established, many of the 'can they really do this?' questions will fall away, for they are merely a reflection of the limited picture which has emerged because previous reports limited themselves to the confines of experimental paradigms. While this was necessary during a period when everyone questioned the existence of a meaningful cognitive relationship between humans and apes, the body of data now overwhelmingly reveals that we are sibling species in mind as well as body. Research strategies that do not take this fact into account in their design will become increasingly irrelevant while new methodologies that permit greater understanding and exploration of the sociocultural world of apes will emerge. They will require a larger canvas than that of the 'traditional experiment'. They must recognize that behavior does not emerge nor manifest its true nature in the barren terrain created through the artificial manipulation of one or two variables—while other factors are spuriously held constant.

Qualitative description has been rejected because of its potential to be swayed by what has been labeled the 'bias of the observer'. Such a label suggests that different observers might see, hear and/or interpret events differently. Several 'remedies' have been proposed to prevent this from occurring. One has been to have multiple observers and to 'train' them to see and hear the same things—and of course to ignore the same things as well. But such training cannot make either observers' prior view more or less correct. It merely requires that they conform in their interpretation of events. Multiple observers, so trained, can be further from the truth than multiple observers who offer different views. The world in which we live our daily lives is peopled by multiple observers with different perspectives. Somehow, from all these joint perspectives, a social reality is created in which all members of a culture share some subjective experiences. Thus it is the overlap—or intersect—between shared realities that becomes important to the group, and it is this that can serve as the subject of scientific inquiry. Ape language needs not to banish qualitative observation, but rather to give it and the narrative their rightful place, by requiring multiple qualitative accounts of the same set of events, and by supporting those accounts with a video record to which all narratives must adhere.

While the story Sue tells of Panbanisha is interesting, it needs to be

fleshed out by the story Panbanisha tells of the same events, as well as by stories that others tell of these and similar events. For it is from the joint narrative that the joint reality emerges—and such realities are a function of the perceptions of all participants. More importantly, they are unique. What exists between one group of human beings and apes may not exist at all between another group of human beings and apes who have not shaped, by means of historical encounters, the same joint communicative reality. All one kind of reality can do is to make a statement of the possible. Thus what is recounted for Kanzi and Panbanisha may not be relevant to Nim or Washoe (apes who participated in sign language studies), but if it is recounted in sufficient detail, by a sufficient number of observers, and if informed by Kanzi and Panbanisha's own accounts and by video record, then it must be recognized as valid, regardless of what is reported for other apes.

### **The Mind of the Other**

We recognize that the abilities described for Kanzi and Panbanisha go far beyond what many other studies of ape cognition have been willing to claim. Indeed, recent work by Reaux, Theall, and Povinelli (1999) contends that *all* ape cognition is significantly different from our own because *all* apes are unable to recognize that others may have different experiences and thus share different states of knowledge about the external world. If this were true, Kanzi and Panbanisha could have no real understanding of, or use for, language. Linguistic communication with other minds takes as a basic premise the view that one tells the other things that they do not already know. It is neither efficient nor interesting to state what is obvious.

Do Kanzi and Panbanisha know that the perspective of others can be different from their own? Certainly their ability to hide objects they don't want anyone to know that they have, and to engage in forbidden activities only when out of sight, implies such an understanding. The great fascination that children and apes experience with the game of hide and seek suggests that in the format of play they strive to work out a detailed understanding of what it is that others can and cannot see from a variety of different angles relative to their own position in space. Recently there has been a burst of interest in the development of the child's ability to determine whether or not another party who sees only a partial set of linear events can draw a different inference than the child him- or herself when the child is shown the complete set. An entire field of study, termed 'Theory of Mind', or ToM, now exists around this topic.

A ToM designed from a 'bonobo-centric' perspective was designed for and presented to Panbanisha in the course of daily events (Savage-Rumbaugh, 1997). The skeletal scenario of events was that person A asked person B for some M&M treats. Person B agreed and began to place the treats into a box for person A. But while this was occurring, person B had to leave. While person B was gone, person A played a 'trick' on person B by taking the M&Ms out of the box and substituting pine needles instead. When person B returned, the box was closed, preventing person B from seeing that a substitution had taken place. Person B then set about opening the box, which proved a bit difficult. While person B was experiencing this difficulty, the ape subject, who had been an observer of the entire series of events, was asked to state what person B was trying to obtain from the box. When presented with this test, Panbanisha answered 'treats', implying that she could differentiate her own knowledge of the actual contents of the box from that of what Person B expected to find in the box.

During the time that this 'test' was being given, many other things occurred which were not part of the test scenario. For example, while M&Ms were being removed from the box, someone who had been cutting in the woods came by. Other people walked past and spoke to the apes. When person B returned, a number of other things happened before he decided to open the box. Thus, from the flow of events, it was necessary for the ape to cognitively link some events together and to ignore others. How is it that such events get linked together and linked jointly in the mind of all participants? While the process is not fully understood, there are two important observations that can be made. Many of the linkages are facilitated by language itself. It is the understanding of comments such as 'I am hungry' and 'Let's play a trick on person X' that permits the ape to make sense, at a later time, of the question 'What is X looking for?' What if such a test was conducted with an ape that had no knowledge of language? They could not understand the question addressed to them, nor could they answer via symbolic means.

Another way of approaching the ToM debate was to ask whether or not Kanzi and Panbanisha recognized that a blind person cannot take in visual information in the same manner as a sighted person. We tested this by permitting them to watch where a food was hidden and then giving them an opportunity to direct both a sighted person and a blind person to the hidden item. In this case the blind person's eyes were open and directed toward Kanzi and Panbanisha. Neither gave gestural information to the blind person, though both provided extensive gestural information to a sighted person, suggesting that they

clearly understood that these individuals had different subjective experiences from each other.

### **Meta-cognition and Symbols in the Vegetation**

Why do the documented capacities of Kanzi and Panbanisha seem to be so far in excess of those attributed to other primates? We suggest two possible answers to this question. The first is that the bi-cultural rearing may have endowed Kanzi and Panbanisha with cognitive skills that derive from human cultural achievements and thus go far beyond anything bonobos could achieve on their own. The other is that the ability of Kanzi and Panbanisha to comprehend and employ a symbolic and syntactical communication system with us permits us to ask—and receive answers to—more sophisticated questions in a direct manner, rather than resorting to conditioning and training techniques that tend to obfuscate an intelligent approach to novel tasks. It is widely recognized that situations which take the control out of the hands of the learner promote rote learning in human subjects and shut down higher cognitive function. Why should the case be different for other species?

These high-level linguistic capacities discussed above suggest that language of some form should exist in the wild. Might it? Trying to determine in the field what would constitute symbolic communication in another species presents a particularly unique challenge. It is far more difficult than decoding another human language. In order to decode a language, we have merely to say things in one language and look for the translation in a second language. But crossing the species boundary presents unique problems—the only thing one can attempt to do is to determine the kinds of things, within the lifestyle of another species, that might prove to require symbolic communication. What might these be?

Certainly there are classes of things that deal with planning and behaviors that need to be coordinated in future space and time, as opposed to present space and time. Many of these things have to do with travel. Any large group of individuals that is traveling in the forest can do so by one of two methods: either they can wander from place to place, finding whatever food they serendipitously encounter; or they can elect intentionally to go from point A to point B in the hopes of randomly encountering food during their travels. Most studies of primate foraging have seemed to view the latter method as the most parsimonious explanation of primate travel patterns (Wrangham, 1986). However, it is not clear that a random walk

through the forest can actually provide all the nutrients required. This is particularly true when meat, as provided by hunting, is not a significant part of the diet. Bonobos, in contrast to chimpanzees, consume very little meat. They are dependent upon fruits and vegetables, which, unlike meat, are not always in a state that permits consumption. Some things can be consumed only as shoots, others only as ripened fruits, and such plants occupy edible states only a small portion of the time. Thus the traveling problem requires not only traveling to the correct location but also going there at the correct time.

In addition, if a number of individuals are bound together by social bonds, consensus regarding which location to travel toward must be achieved, as wandering about the forest is not a viable strategy of obtaining sufficient food for a group of 100 large apes. Several different models for how a group might make such a decision can be put forth: the simplest would be that of a 'king' who makes all decisions; the most complex being that of a sort of 'voting' system in which each individual offers a suggestion, suggestions are discussed and some sort of group 'voting' occurs, and all members are bound by the outcome of the vote. Such a model seems to be the one that best explains the way in which a large group of bonobos behaves prior to moving from one feeding location to another. Males drag branches in several different directions as though specifying alternative paths of travel (Kano, 1992).

Once travel begins, the group as a whole does not leave, but rather travel occurs in small sub-parties that have no visual contact with others and which are separated by 15 to 20 minutes in time. While much vocalization takes place between sub-parties in the trees prior to travel, travel itself is exceedingly quiet. Since the goal of the sub-parties is to meet and rejoin later, it appears that either they are deciding in advance their travel destination or they are communicating this en route by some other means. Because of predation, bonobos appear to place a premium on quiet travel. If there is a need to communicate between sub-groups while they are traveling, they cannot resort to vocalizations without giving away their sensitive ground location to predators. They appear, as a result, to have evolved a system of leaving notes in the vegetation. These notes apparently can encode resting areas, directions of travel, points of brief arboreal travel to avoid traps, and probably many other kinds of information as well (Savage-Rumbaugh, Williams, Furuichi, & Kano, 1996).

Systematic data collection during two independent day-long follows revealed that these cues were not left at arbitrary points in the vegetation but rather at locations where trails split and where an individual following might be confused as to the correct direction to take.

Because of these cues, not only other bonobos, but human trackers as well, could easily and rapidly follow a group of bonobos moving through the forest (Figure 1).

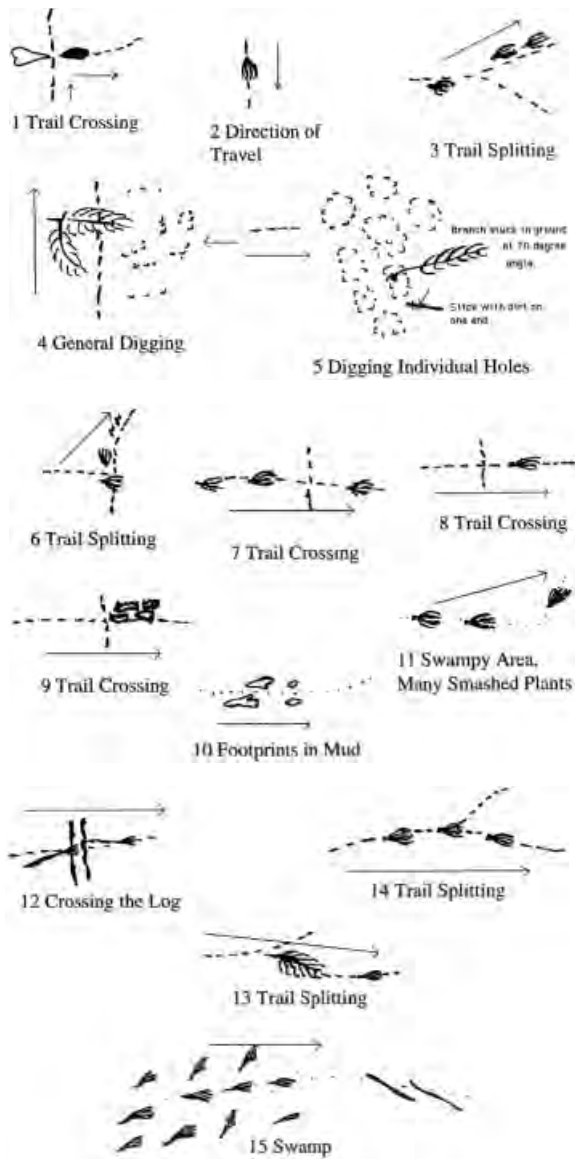


Figure 1. Bonobos using plants as symbols

## Conclusion

We are only beginning to uncover the potential and extant cognitive and communicative capacities of bonobos. The information that is already available suggests that they have a social structure and communicative system that is uniquely different from other apes. We believe that symbolic referential communication in the wild will be documented in the future, as will tool use and many different forms of group social structure. The bonobo, like us, is an extremely malleable creature. The hand of culture acts strongly upon its biological substrate, rendering each generation a carrier wave of past actions and decisions that will influence greatly the behavior of the next generation. Captive studies have revealed this potential and their findings should permit us and other field workers to take an increasingly broader and more realistic look at the purpose and intent of communications in the wild.

## Appendix

Below is a sample of 1 minute 30 seconds extracted from a 10-minute dialogue with Kanzi about what is in another room. Kanzi was an adult at this time. This short extract reveals the way in which Kanzi interjects vocal comment while a person is speaking, as well as the way he intermingles keyboard communications with vocal communications. In addition, it illustrates the nature of a dialogue with Kanzi.

This dialogue was transcribed from a video tape made while NHK was filming. Several days prior to this conversation a bunny costume had been placed in a plastic bag in the bedroom. I (Sue) am wondering if Kanzi knew whether or not this costume is in the bedroom. He had a chance to look through a window and see the plastic bag and possibly part of the costume, but prior to this conversation I was unaware whether he had done so or not.

During this dialogue (and most others) Kanzi interrupts my speech with vocal comments very frequently. Often his interruptions—which are English-like—will express agreement (*Yeah, right*), but on other occasions they expand on the keyboard upon what he has said.

Conventions of notation:

Regular font: experimenter's speech and/or keyboard utterances

*Italics*: Kanzi's vocalizations

Italics: Kanzi's keyboard utterances

( ): Comments on Kanzi's gestures and glances

If you are thinking about the bedroom,

Yeah (Here Kanzi is indicating his agreement with my comment)

and what's in the bedroom

*Room*

You can talk about it on your keyboard, OK?

*Nyota* (Here Kanzi is saying Nyota in a complaining manner, as Nyota, a small bonobo, is walking on the lexigrams just as Kanzi is trying to talk.)

*Right, bedroom.*

Grouproom Grouproom? *Room*

Playyard Playard? *Um hmh* (Kanzi also indicates that a key is needed to open the bedroom.)

Key Key? *Right.*

(Above, Kanzi is talking both on the keyboard and vocally. He is stating the names of places where he would like to go and telling me that a key is needed to do so.)

Do you want me *Yeah, room* to give uhm ??? you *Yeah* the key that opens?

Open (Kanzi looks at me and looks at the bedroom)

Over there? *There* (Kanzi points to the bedroom)

Ohhh! *Hmmm*

You want to open bedroom?

Bedroom (Kanzi keeps his finger on the lexigram and looks at me)

Bedroom hmmm.

Kanzi, What is in the bedroom? (I have hidden something in the bedroom earlier and I am wondering if Kanzi saw what it was, but he did not. When he cannot say what is in the bedroom, he suggests something that he would like to have in the bedroom and shows me where it is.)

Bedroom (Kanzi points to the bedroom lexigram, looks at me and nods his head.)

What is in the bedroom?

(Kanzi does not know what I have hidden in the bedroom so he suggests something that can be taken into the bedroom.)

Bedroom apples Bedroom, apples? *Right.*

(Kanzi reaffirms every time I query to make sure that I understand him correctly.)

Apples? *There* (Kanzi gestures toward apples.)

Apples over there? *Apple*

Apples? *Yeah, right*

You *Um* want to *Room* take *Yeah* apples to *Now* the bedroom?

Bedroom, *Uh hmmm* (Kanzi points to the bedroom and looks at me with a questioning expression.)

Yuh do.

Well today *Bedroom* (Kanzi looks toward the bedroom as he says this.)

We are doing TV camera in group room

(I am starting to explain to Kanzi why I don't want to open the bedroom right then. As soon as he realizes this, he shifts topics as well: from taking apples into the bedroom, to mentioning that he would like some peanuts.)

Today ... (As I shift topics here, Kanzi does so as well.)

*Peanut*

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