

Kanzi vs Descartes

Sue Savage-Rumbaugh and her co-authors have written a densely argued book about one of the most fascinating topics in semiotics "How do we recognize the presence of language?". This encompasses 'What is Language? What is its function? and where does it come from in terms of mentation?'. The major study subject of this book, Apes Language and the Human Mind, is a Bonobo named Kanzi who is widely considered to be the most linguistically competent ape alive today. He grew up in a lexigram and vocal English using social group with his step mother (in his early life) and many researchers, who rather than training him, lived with him in an intensely interactive social milieu. Ironically this is what Herbert Terrace, who later decried linguistic capabilities in Chimpanzees, had originally planned for his experiment with a chimpanzee named Nim. Nim was supposed to be raised as a signing chimp integrated into a household with deaf children but this project did not come to fruition. In the years since the first experiment with Washoe, the first sign language using chimp in the late 1960's, most ape language researchers have struggled to set up criteria for what constitutes language capability in apes and how to test whether their charges could be said to have it. As research progressed the bar was raised from 1 word comprehension (labeling), to meeting Hockett's 6 major criteria (Hockett 1963) such as prolongation of reference and separation of content and affect, to a need to demonstrate comprehension of novel utterances. The argument about where to draw the line, and whether compliance with requests similar to a young child's abilities is sufficient, is to a large extent based on whether the examiner has a continuist or Cartesianist approach to the question of what is language.

Terrace clearly lays out the Cartesianist approach that animals, no matter what their behaviour, simply have no mental constructs or intentions, and no way to refer to the past or future. This arises from the position that all their behavior is either reflexive, instinctive or arises from an association of ideas and does not reflect any complex mental abilities. This is the source of the mechanistic view of animals, and there is no test or experiment or personal observation that would convince a Cartesianist that an ape could have a theory of mind, or intent, or any conceptual thought. This position is referred to as the bifurcation theory .

Savage-Rumbaugh, on the other hand, is much more of an operationalist. From her perspective if use of English and lexigrams functions to allow joint decision making, completion of tasks and request fulfillment then the basis of what we could call linguistic competence are present. In terms of using multiple levels of communication and the argument that this

invalidates a claim of language comprehension, she argues that even humans use non verbal cues in their face to face communication and prosodic cues in their telephone or written interactions. She says that human's use of language is so pervasive that it overpowers our recognition that we use such alternate cues, to the extent that we believe that we communicate mainly in words and do not focus on the levels and implications of communicative abilities shown by animals. The use of pictures, vocal English and lexigrams, rather than just one modality, allows an advanced level of complexity, which is a major function of language in both social and practical terms. Kanzi, at age 9 was tested with over 600 novel commands which must have seemed quite non-functional to him, (such as "throw the water on the vacuum cleaner"), but he complied with 72% of them which was better response rate than the 21/2 year old human who was the control. Note that his age and hers are quite equivalent, based on the findings in Russon et al's book referred to in the previous lecture. The social component of language is another vital aspect which Savage Rumbaugh argues is a basic function of communication. Infants start to respond to caregivers' indications long before they can produce language and this interaction is a vital part of socialization. Language allows co-ordination of actions, sharing of thoughts and planning for the future. Kanzi is capable of interacting with humans on all of these levels which differentiates him from non-linguistic apes. The social complexity of his world includes both bonobos and humans as reading the chapter on living with Kanzi makes very clear.

What Savage-Rumbaugh and the others are arguing in this book is that ape language proficiency should be judged by 2 requirements when being compared with human language. These are a Commonality requirement and an Equivalency requirement. This means that the same types of questions should be asked about specific metalinguistic claims for apes and children, and that the same method of evaluation with the same criteria for success should be used when testing them. If these requirements were accepted, then the Cartesianist position that similar behaviours can arise in one case from mental understanding and in the other from 'pure instinct' would no longer hold. Following from this, observation of experimental results rather than a theoretical position about what the results might mean, would become the criterion for passing the test. This is not yet the case, but this book provides a powerful argument towards it.

For a book with only 227 pages of text this one packs in a lot of information, thought and controversy in only 4 chapters. In many ways it is two books consolidated into one; an account of the life and socialization process of Kanzi (and his sisters) who are the Bonobos (*Pan paniscus*) claimed to understand a great deal of spoken English, and a philosophical discussion of the nature of language and the mind. The three authors form a team of individuals well qualified to address these issues, since they are the Psychologist who raised Kanzi, a professor of Philosophy and Psychology, and a professor of English and Linguistics. They all have their points of view, but in the preface they clearly state that the book is a compilation of their joint ideas, rather than being an edited volume. The Philosopher and Linguist did not rely only on long distance communication but spent some time interacting with and observing Kanzi and the other bonobos and chimpanzees at the Georgia State University Language Research Center in Atlanta, Georgia. As Shanker and Taylor mentioned in a television broadcast about this book, the experience of actually seeing Kanzi performing some of the linguistic tests and interacting with people and other linguistic trained chimpanzees provided a whole additional dimension to their understanding of the controversy. The stated aim of the book is to analyze the theoretical and philosophical implications of the Kanzi research, but it does this by addressing two major and one minor issues. The two aspects of this book are a description of Kanzi's life and accomplishments, and a discussion of the philosophical background for why it is so difficult for many people to accept the possibility that apes can comprehend and communicate in a human language. The minor issue brought up at the end of the book concerns the moral implications of the outcome of this research. If animals can make their wants, needs and wishes known in a language we can comprehend, does this alter our relationship to them?

The first chapter discusses the background and rearing of Kanzi and his sister Panbanisha. It provides information about their origin, their lives, their interactions with humans, and animals and how the evidence was gathered to make the claims for language comprehension that are being made on their behalf by Savage-Rumbaugh. Of particular interest are references to how Kanzi's abilities compare with those of Sherman and Austin, two common chimpanzees who were trained in lexigram use during the 1970's and 1980's. The major difference here is that Kanzi was not trained to use these computer based graphics with assigned meanings (lexigrams). He was an infant clinging to his mother and playing in the lab while other animals were being trained around him. Yet when he was weaned and his mother sent away, he suddenly revealed (in the first day) that he could appropriately use all 12 of the lexigrams on the keyboard and made 120 different utterances. This was in contrast to the 3 lexigrams and 21 uses he had made the day before his mother left. The difference seemed to be that with his mother no longer there to interact with he had to interact with the researchers, and they used the lexigram keyboard as a major source of information. On that first day when he was alone, Kanzi not only used all 12 lexigrams on the keyboard but he made several two lexigram requests and used the keyboard to comment as well as to request. His mother's absence clearly did not cause these abilities, but changed Kanzi's motivation to interact with the researchers in the manner that was important to them. His abilities came as a considerable shock to Savage-Rumbaugh since although Kanzi was 2 1/2 years old she had not spent any time training him at all. A major methodological problem for her was that not only did she not know what had happened but, Kanzi was very unwilling to sit still for blind testing. Since

he had just been artificially weaned she was not willing to starve him into participating in testing so Savage-Rumbaugh decided just to continue talking with Kanzi, focusing on using any means they could to help him understand what was said. Since the keyboard had so few symbols, the researchers used considerable amounts of gesture and spoken English, as well as expanding the keyboard as much as possible. It should be noted at this point that the location of lexigrams on the keyboard was changed frequently (sometimes with each use of the board) to counter the argument that correct keyboard use was merely a 'position effect'. Kanzi had begun to use indicative gesture long before his mother left and used it not only with humans but also with his mother who only sometimes complied with his requests. In addition to spoken English, gestures and lexigrams, pictures were often used to indicate things and locations which were of interest to Kanzi. He would use combinations of all of these to suggest where he wanted to go, or what he wanted to eat. These two activities were the focus of his day, as Savage-Rumbaugh attempted to provoke his interest with the kind of things that wild bonobos spend their time doing -- traveling, eating, and interacting socially. He would combine a variety of communicative outputs to expand and reinforce the messages, even though he could not use spoken English. The possibility of humans cuing his answers were reduced by his use of multiple channels, the difficulty of getting him to do anything he didn't want to, and the fairly small size of the lexigrams. In addition, he often sat on people's shoulders and pointed to lexigrams on portable picture boards, which he was viewing from directly above the head of the researcher, making it very difficult to argue that gaze direction of the researcher -- whose face he could not see -- had anything to do with his choices.

All of this information is very much what outsiders interested in this research have wanted to know. Exactly how, when and what did the researchers and Kanzi do to get to the state where he appears to understand a great deal of spoken English. When he was nine years old, Savage-Rumbaugh challenged him by sitting behind a one way mirror and presenting him with 660 novel requests with each sentence being presented only once. He had a 72% success rate of compliance which compared favorably with the results for a 2 1/2 year old girl who was able to correctly respond to 66% of the requests. Some of these requests were rather odd -- like "put some water on the vacuum cleaner" and not the kind of thing that could be guessed by looking at what objects were in the vicinity. He did make some errors when the same words were used in two different ways, or when they had phonemes that sounded very similar. However, his errors were not those of syntax. He did not "throw the turtle to the lettuce", when asked to "throw the lettuce to the turtle" for example. He (and the child) readily understood, 'go to X and get Y' (difference between object and location) and action of one party on an object -- eg. "See if you can make the doggie bite your ball" (p. 71) As time has gone on, Kanzi's ability to understand spoken English whether or not it is specifically directed towards him, means that he can respond appropriately to comments and questions even relayed over the telephone. When one visitor told him on the phone that she was bringing him a surprise, his first response when he saw her was to go to the keyboard and ask for his surprise. This of course implies not only voice recognition but a complete absence of anything other than a vocal source of information.

It is of particular interest that Kanzi's young sister Panbanisha has capabilities similar to his, while his mother who was wild born and became captive at age

six, and two other young bonobos, who were not interacted with at the same level, have much less ability to respond to linguistic input. Even Austin and Sherman who spent many years being trained in the use of lexigrams and who have remarkable abilities in terms of sharing co-operating and correcting each other, do not have the level of recognition of spoken English that Kanzi seems to possess. The question that immediately comes to mind is, "Why?". What happened to Kanzi and his sister that did not happen to the others. The answer seems to have something to do with the kind of social relationship established between the human care giver/researchers and these bonobos. In a sense they lived in their own little world, constructed around the needs and interests of bonobos. Quiatt and Reynolds (1995) discuss the development of language as a social system structure, or a socially communicable repository of information made up of individual memory, the collective working memory of a group and extra somatic stores of information.

"The character of knowledge ...must be determined in part by the particular relationships that obtain between individuals who share it; bits of the information that make it up reside in these social relations, to be released in or expressed by specific interactions guided by social knowledge." (Quiatt and Reynolds 1995: p. 189)

A major aspect of this is the construction of a world with privatization of meaning between individuals as an important aspect of the task. The relationships in such a world are unavoidably central to the communication under study. Whether they are trainer-subject, teacher-pupil or friendly relations, Kanzi had to learn that the researchers were his social group. They slept with him when he was young, groomed with him, shared food with him, played with him, carried him, and spent as much time with him as possible. When he was sick he had round the clock companionship. In terms of food, he was involved in bringing it into the lab, storing it, preparing it and eating it, in concert with the humans. The lab was transformed into a little world centred around the preparation and consumption of food; sharing, co-operating to achieve this end, using tools, and using symbolic aspects of communication. He responded appropriately to requests like, "Kanzi, get the potatoes, cut them up and put them in a pot on the stove.", by retrieving the potatoes, cutting them with a knife, putting first water then potatoes in the pot, and putting it on the stove. This type of response to a request seems like a good example of the 3 way relationship between language, social interaction and material processing that suggests a conceptual approach to the world. Much of the structure of language comes from it being a process of communication between an intelligent speaker and hearer occurring in a setting of mutual knowledge. This is not to argue that human -- bonobo communication is as quick and unambiguous and possesses the same level of emotional rapport as communication between humans. Rapport is a very important aspect of individual interchange of information. Individuals who have known each other for a long time have a much more telegraphic style of verbal communication, use much less complex grammar and use more non verbal cues in their dialogue than individuals who know each other less well. Yet the quality of the interaction is often considered to be richer and more informative, implicative rather than explicative. (Scheibe:1981) These differences seem to be due to the fact that such closely known individuals no longer have to communicate about social factors such as status, kinship, reproductive availability or rank relations which are deep functions of a considerable portion of human communication.

This kind of socially relevant information is carried in the minds and communication systems of social primates as well. What is more important to language however is the processing of information, the transmission of intention and the direction of activities.

Communication in primate and human societies does function somewhat differently. Among the apes, food, play, and socially relevant information are the most important foci of attention. For humans, the bidirectionality and interaction promoted by communication is a very important aspect. It is not just the transfer of information and ideas but the development of relationships that is truly vital. This may be, to some extent, why we see language as such a uniquely human phenomenon. This shows up to a certain extent in the argument that young children are not competent in language, even though they can often label, request, and use 2-3 word strings, because it is argued, from the Cartesian position, they do not have a self created mental world. They can use sounds to acquire ends and have an atomistic grasp of words, but do not use sentences to communicate thoughts. According to a Cartesian approach, the appearance of continuity between what children and apes can do and what true language use involves has to do with areas of collateral social skills which tend to be over interpreted.

Chapter 2 of this book begins with a brief discussion of the Cartesian emphasis of the importance of the mind as a division between humans and animals, Descartes insisted that there was a break between humans and animals which contradicted the metaphor of the Great Chain of Being --connecting the lowest forms of the created with God himself. Man may have a body like an animal, but he has reason with which he can reflect, exercise moral choice, be conscious of his internal state, speak language and live in society. To Descartes, the mind of a humans is the centre of the universe, creating the world around him. Animals, on the other hand, have no mind, no ideas, no internal life at all, but operate on instinct and have a totally mechanistic nature. Other philosophers of the time argued that it was not 'mind' but 'free will' which distinguished between humans and animals. The important point is that if animals are only mechanistic then mental terms are completely non-useful to refer to their behaviour. They cannot 'want', 'intend', 'desire', 'believe', or engage in any mental action. With no mind they can have no 'theory of mind' and no voluntary action. Speech is seen as a marker of voluntary action and thus humans alone could have speech. The difference between possession of 'mind' and 'free will' as an attribute of animals does influence our understanding in that if animals are allowed 'mind' it accounts for them having 'senses and ideas'. However, they certainly were not seen as having free will, because -- according to Condillac, the soul was the source of free will and, souls were surely a human prerogative.

From this view point, the communication system of animals (and children) were accepted as natural expressive behaviour but they referred only to situations not to ideas. Descartes argued that animals do not form concepts to make sense of the world or use words to refer to these concepts. Learning a language was more than learning vocabulary and rules of grammar. It also involved learning rules of discourse, when and how to speak, and to recognize the implicit beliefs that organize the social and mental lives of society. It also involves using words to learn about language. These language skills, which gradually emerge in children, allow them to move from having a self that sees, feels, desires,

understands, believes, etc., to a self which also accepts the concepts of thought, perception, desire, intention, belief, etc. Thus each activity is not only itself, but an *instance* of itself. It is necessary to be able to distinguish between thoughts and things; between internal mental phenomena, and external behaviour. Animals, according to Cartesians lack these capabilities. They have no way to refer to the past or the future, and thus all their behaviour is explained as reflexive, an association of ideas, or instinct. This is the source of the mechanistic view of animals and the argument that a study of animal behaviour is excluded from all aspects of the study of human cognition. The label for this is bifurcation. All apparently intelligent animal behaviour is interpreted as merely reflexive responses to stimuli. Even when similar behaviours are produced by human and animal, such as a female rescuing her young from danger, the two actions are seen as fundamentally different, and arising from different foundations of behaviour, one mental and one mechanistic. From this perspective it is understandable that no matter what the evidence, a Cartesianist would not accept any linguistic behaviour on the part of an ape as an indication of language use. "I do not hesitate to take a position...that evidence or argument does not compel us to grant true conversational capacity to any other than human alters." (Scheibe 1981: 166-167)

However, there are alternative viewpoints. Even Terrace who published extensively on the non-linguistic nature of ape signing suggested a moderation of the bifurcationist viewpoint, in which it could be accepted that animals think and construct concepts but that they cannot name these concepts. This would allow an argument that an animal's behaviour can be guided by mental representation, but does not assume that animals share human cognition. Thus they could form classes of 'same' and 'different' to sort test items into, have choices, have intention, and have references, without having the ability to refer to these concepts, and therefore not have linguistic skills.

The alternative side to this in terms of children is the telementational view of language; that it is not something that is learned, but it grows in the child. According to this viewpoint, children's linguistic skills are based on the activation of mental switches which allow the children to develop from using proto-language vocalizations which function to do things, to using sounds as linguistic symbols to signify mental representation. This is the source of the idea that first level mental states are not enough to infer language, but that a theory of mind is required.

Is there a set of processes by which a child constructs a theory of mind? In current research on children it seems clear that comprehension of language markedly precedes production. Can this lead to an argument that interaction on the basis of predicting others actions and responses is a foundation for the way we can discuss this problem? From this viewpoint, a route into linguistics proceeds as much through understanding what others think and feel, as it does through what they say. Children learn the utility of 'believing "X"' as a way to predict human behaviour -- much as they learn the utility of "believing in gravity" even though they may not understand it. What is important is the consideration of activities so that families function and children get their needs met. Cartesianists see children's and animal's abilities as diverging at this point as far as language (mental states) are concerned. A continuum between what children and animals can do does not exist because the mental foundation for

children's communication, even at a simple level is totally different than an animal's. At this point, Savage-Rumbaugh disagrees, arguing that it is the comprehension of relationships rather than mental states that is the foundation of linguistics. She argues that primitive linguistic behaviour emerges from pre-linguistic behaviour as words become tools rather than labels for her subjects (both human and bonobo). Another factor to keep in mind is that Kanzi does not operate at only one level. He is comparable to a 15-18 month old child in production, a 21/2 year old in comprehension and a 7-8 year old in cognitive and motor skills. Kanzi can use the word 'apple' in a conversation -- not just as a demand. According to reports, he can follow other people's conversations and acquire information out of them, as well as instantly comprehending novel word combinations.

The infant starts to respond to its care giver's indications, explores means to solicit help, coordinates increasingly complex social interactions, begins to initiate interactions and eventually reaches symbolic communication of intention. As Wittgenstein argues there is a "penetration of gesture into verbal language." (p.134) As this happens in children, Savage-Rumbaugh also sees it happening in ape communication. Kanzi at the age of 1 year was using gesture to indicate where he wanted to go. By age 21/2 he could use lexigrams and pictures as well as gestures to request food, various types of interaction and indicate where he would like to go. As he became more proficient he used lexigrams, vocalizations and gestures to indicate desires, initiate games, comment on the world and mediate social interactions. As an adult he can respond correctly to complex sentences, utilize simple syntax, plan activities in advance and discuss imaginary objects as well as what he plans to do. This interpretation of his activities is a non-Cartesian approach potentially indicating that Kanzi understands the function of communication. To Savage-Rumbaugh, cognition is an active mental process by which the mind 'makes sense' out of the world around it. If you argued that animals could not 'make sense' of the world, they would exist in a state of total chaos which they clearly do not. However, to the Cartesianists, an agent is perceptually acquainted with its own mental states but can only infer what another agent is thinking or feeling. Because of this we humans construct the world around us mentally and infer that other humans' actions are mentally caused in the same way our own are. Language is a way of presenting facts, but the grammar of mental discourse is determined by language, independent of mental phenomena. The problem with this argument is that Cartesianists will not be won over by Ape Language researchers insisting that Kanzi fulfills the criteria of functional interactive intentional communication. Classical psychology has the idea that its task is to solve epistemological problems such as the mind-body dichotomy, the problem of other minds, the nature of intentionality and the acquisition of a theory of mind. The pragmatists are more interested in what apes can do, rather than in what they can not and depend on observation of behaviour to acquire their data.

Moving to chapter 3 the question is raised of "What is meant by 'clearly understanding' a request?". Is it doing what is asked? Doing all of it? Responding when not addressed? Not doing it when asked not to? etc. Scientists do not agree on 'common sense answers' partly because it is totally unclear what methods of evaluation would allow an unambiguous acceptance of evidence. Many people (and animals) might not perform a request for a wide variety of reasons from not hearing it, to not wanting to, to inability, but still be able to comprehend it easily. What would be proof that signs or lexigrams as

used by an ape really refer to something? Using different criteria will give wildly different answers to this question. The important common ground to base an argument on is, "Do we use the same evaluative criteria for children and apes?". If we do not, then all the data that could be assembled will not help to solve the problem. In order to address the issue the authors of this book argue that there are two logical prerequisites:

1. a Commonality requirement;
2. an Equality requirement

The first involves the understanding that the same method of evaluation must be used by all who judge whether a specific metalinguistic claim can be asserted about either apes or children. The Equality requirement postulates that the same method of evaluation must be used in assessing claims about both apes and children. In other words, all judges must use the same criteria in evaluating any one metalinguistic aspect, such as intentionality, reflexiveness, etc. and both apes and children must be judged on the same scale. This latter criterion is particularly important when looking at the starting position of skeptics. If skeptics agree that communication involves mutual understanding by two people who speak the same language (eg. English) and then look for evidence of that understanding, they begin from quite a different place and will probably have quite different criteria for success than skeptics whose starting position is that humans don't usually understand what they say to each other, and no two people ever have or ever will speak the same language. At some level this is true, but if all members of society operated on these assumptions, there would soon be no society, positive interaction, or cooperation occurring among humans. Thus skeptics can question what we call 'truisms' but in general for language to operate we need to accept these truisms as a functional basis for success. The basics of mutual understanding and the idea that the truth of what we say depends on the facts, and that the words we use actually refer to something, is what Wittgenstein refers to as the 'raw materials' underlying language. Based on these 'truisms' we are led to an understanding that the difference between comprehension and non-comprehension is real, not metalinguistic, even though we know that this is only true to an extent. Can we say we understand a human? Do apes understand other apes? Do lab reared apes understand humans? If we do not accept the correlation of request and response in animals is this a pattern of acceptable scientific rigor? Would it be an acceptable criterion to judge human comprehension? The next question of importance is "What observation or experiment would be sufficient for it to be justifiably asserted that an ape understands what a spoken English sentence means?". (p.153)

According to the arguments above we must be clear that the ape actually understands the sentence, not seems to understand or acts like he understands, and the criterion must be the same for apes as for humans. The problem is that laying the question out this way makes it an epistemological conception of the problem based on knowledge, evidence and evaluation. The onus should be on the skeptic to prove that a human who did comply with a request did not understand it, and the same onus should be on the skeptical ape observer, rather than the ape language researcher having to prove that the ape did understand the request. The converse of this has always been that parsimony requires the simplest answer; the animal was trained, was cued, was acting instinctively, was doing anything but understanding the request even though he fulfilled it. However, in my view it is not parsimonious to assert that two very different

systems cause the same result under the same circumstances, as when an ape and a human were each presented with an unusual novel request presented one time only ("Put the grapes in the swimming pool."). The major problem with a reductionist argument which requires compliance with a request to assume its comprehension is that in many cases (among humans) we know there is comprehension without compliance. Since we know this standard for comprehension does not always work for humans we cannot apply it to apes.

The opposite strategy to judging reductively is to use an operationalist approach. Here we judge not just the compliance with the request but the 'in fact' understanding of it, by setting up experiments. However, we cannot prove an hypothesis with experiments -- merely disprove it -- and as a result a skeptic could argue that something else could be causing the results seen in the experiment, and the message could still not be understood. There could be an incredible range of experiments proposed and still the question would not be settled. You could end up at the level of the structuralist requirement that you cannot understand one word in a language unless you understand the whole language. Thus this approach is not really practical or relevant when discussing ape language since no one is arguing a complete comprehension of an entire human language for an ape (and few are the humans who know an *entire* language as well). An operationalist viewpoint converts the answer of understanding a request from evidence derived through behaviour, to an explanatory theory which must be the best one available. Thus neither reductionism nor operationalism are going to provide a mechanism for answering the question of how do we know that a request has been understood. The answer to our dilemma of how do we know is to ask ourselves whether we have to question whether apes really understand a request if they respond correctly to it, any more than we would ask such a question if we saw a human correctly respond to the same request. We can look at their interaction with the request from a functional view point Request fulfilment is a part of a functional interrelation and it is not legitimate to take the communication interaction out of context or extract it from the social and physical relationships in which it exists. To take a communicative interaction out of context is to strip it of most of what makes it comprehensible. In fact context can make non-words comprehensible -- as Edward Lear and Lewis Carroll well knew. Evaluating what Kanzi can do, what children can do and what adult humans can do communicatively can be better addressed with practical methods than with the philosophical or epistemological positions outlined above. Does this mean we cannot evaluate metalinguistic and cognitive claims according to the experimental method? Of course not, as long as we apply our criteria to humans as well. The important difference in judging this is not to employ a logical structure for the argument that will not permit an answer to be analyzed or evaluated. If we examine language from a pragmatic, functionalist viewpoint we assess how it contributes to the success of the organisms using it. For humans in particular, the development of phonemes and the ability to define the world around us more closely by intricate labeling, increases the complexity of the environment. This occurs not only in the physical world, but also the social world. We can have much more detailed ways to refer to individual relationships, and to our mental understanding of such relationships, and of our responses to them by using language. The concept and data we transmit are not only ideational but social. By means of these concepts we develop the complexities of what we see as our preserve which is the concept of culture. Humans use language to process information and what is culture but a process of recognizing the constraints on

individual cognition and action in competing for local resources. This is the kind of constraint that Savage-Rumbaugh refers to in the last chapter of the book when she discusses the organization of wild bonobo exploitation of sugar cane provisions put out by researchers. The males of the group charge at and disperse any humans present, then wait on the periphery until the females have gathered up sugar cane before they come in to the area and retrieve a share. They not only do this, but reprimand (sit on) juveniles who attempt to move in ahead of the females to get some. The social results of this do not necessarily reflect female dominance over males in feeding, but social cooperation which allows the maximum number of animals to feed in maximum safety. Clearly these are not human -- this is not linguistic behaviour -- but it is an example of complex multi-layered social understanding which can occur in a non linguistic but highly complex social group. The argument that bonobos (and other apes) cannot use language because if they could they would have developed it in the wild is really not very relevant. On the one hand, apes live in extremely complex social and environmental circumstances and have very extensive multi-channel communication systems. Present research on monkey and ape natural communication makes it clear (to me, at any rate) that we have far underestimated the complexity and layering of their communicative abilities. Their cognitive skills and the amount of learning necessary to live successfully in the wild presupposes learning on a major scale. On the other hand, the difference between Kanzi and his sister's abilities to respond to spoken English, and their mother's and other siblings', is proof that rearing conditions are absolutely vital in developing these abilities. Years of training did not begin to allow Matata, his mother, to perform at the level Kanzi picked up without training just by being exposed to a linguistic environment at a young age (6 months to 2 1/2 years). Even after Kanzi had begun to perform well his other siblings who were raised in the lab, but behind wire barriers did not achieve his level of competence. It was only when his young sister Panbanisha was weaned early and exposed to the same high intensity constant interaction with researchers as Kanzi had been, that she began to demonstrate a pattern like Kanzi's. Neurobiologists argue that stimulation of nerve fibres early and often will promote growth and dendritic branching in the brain, which may be a factor in developing language competency. It is not just exposure to English that is relevant, but the constant fostering of intense social relationships which provides the substrate on which these abilities can be developed. This argument, that language abilities are not innate, but are developed anew in each individual through the nature of his or her developing relationship with the world, are rather disturbing in their implications for many researchers. If the critical period for developing language competence actually involves establishing the requisite neural pathways, this has major implications for development and interaction patterns with young children, and the treatment of those who are damaged either physically or psychologically. One major factor seems to be the implication of a pattern analyzing mechanism in the brain which permits and influences the speed of pattern identification. Experiment reveals that the speech stream comes in as a rapid continuous signal which infants learn to segment into words and phonemes. The faster and more accurate we become at this, the better our speech comprehension becomes. Infants learn these skills long before they can talk and we simply do not know whether and at what age animals can learn also. However, even for Kanzi, his level of reception far exceeds his level of production. We can hear much faster than we can speak and in some ways this seems redundant until we realize that for most of our evolutionary past we were not listening to words but natural

sounds such as the rustle of branches that might conceal an approaching predator. From personal experience I can attest that with enough time in the forest you can hear the difference in leaf rustling pattern between a macaque and a gibbon approaching, and this level of attention to detail would surely have survival value for early hominids. We did not develop our hearing skills in an evolutionary sense mainly to hear words, just as apes may not have developed mental skills in order to learn English. Many people who have worked with an ape personally over a long time period will argue that they can understand a great deal of spoken language. The Hayes claimed that Vicki understood about 90 English phrases.(Hayes: 1951) Possibly neural image scanners will help us to understand what areas of the brain are activated when spoken English is presented and whether there is a neural connection between hearing and response. Recognition of people, labeling of places and things is a first step in language use and is often called primitive or proto-language. It is generalization, picking a word out of a stream, considering a mental concept such as 'sorry' which are the levels that we are now judging. If behaviours are linguistically encoded in humans, it is assumed they are not instinctive and thus these behaviours can be taken 'at face value' as validators of language expression. When we look at humans we can attribute thoughts, feelings, and mental states to them which may or may not be there, but we attribute them because we know from the inside what such facial expressions, words and actions are 'intended ' to represent. This is anthropomorphism according to Savage-Rumbaugh, as much as attributing those same thoughts and mental feelings to apes. I'm not quite sure about this argument myself, but I think most humans would agree that in the absence of deceit you can tell quite a lot about how and what a person is thinking and feeling by prolonged repeated observation even in the absence of language cues. Someone who has a clear grasp of what an apes' world view is like and who has a strong personal bond with one should be able to do much the same in relation to it. If such a person/ape pair can also foster their social relations, improve their cooperation and transmit information about the world and their own emotional state by the use of agreed on arbitrary symbols such as English words on the one hand and lexigrams on the other -- it seems to me that many of the functions of language use have been fulfilled. This presupposes a particular view of language in a continuum from communication, but when the range of attributes of human language is considered, it is made up of a huge number of inputs and this view point seems at least as valid a one as the position that language is entirely about the mental world of humans.

The last question of the book, which is dealt with in the final few pages concerns what changes might occur in the science of animal behaviour if we were to accept the behaviour of animals as intentionally communicative? To some extent every dog owner will claim that his/her pet can communicate a desire to be fed or to go out. At the other end of this range we have been discussing the philosophical arguments about the validity of internal mental states in animals. Do they 'want', 'intend', or 'believe' anything about their environment or social relations. The only way we can judge this, so far, is by observing their behaviour. As Savage Rumbaugh points out language is abehaviour too. We can observe its occurrence and use, and the results of these. We give patterns of behaviour names and then respond to these patterns as if they were real. Is 'sorry' any more or less 'real' than 'onions'? How could we accept labeling as more or less real for either of them, just because only one is a concrete thing we can hold in our hands? Just as we can accept the reality of

'onions' even though they come in many shapes and sizes, we can accept the reality of 'sorry' when used by a human or an ape that generates a pattern of action that is congruent with how we understand the emotion. Of course either species could lie about feeling the emotion, and use the word for social or symbolic ends, just as a cook could lie about the onions (or pork) in the soup. But this does not mean that one word has more validity than another or one species more accuracy than another when using the term. Savage-Rumbaugh argues that our language use permits us to concentrate so hard on what we do that we do not focus on what are the levels and implications of the communicative abilities shown by animals. She ends by suggesting that there would be major implications for all behaviour researchers if we stopped talking for a little while and started listening.

This book had three very specific uses in my opinion. The first was the description of Kanzi's growth and development. Many research articles give specific details of a particular study without providing the context required to set the data into a framework of the development of a living being. The second major achievement was to make it clear why a Cartesian philosophical perspective was completely antithetical to accepting the possibility that apes can use language. If similarity of behaviour is not accepted as arising from a similar basis for ability then the argument is not about ape language use at all, but about a fundamental view of the world. Given these constraints, those who are focusing their time and effort on exploring ape use of linguistic systems can stop attempting to design experiments which will attempt to convince Cartesianists, and focus on exploring the more functional aspects of communication. The data they gather may later be used to address the issue of a philosophical view of the world, mind and cognition, but it is a case where the complete war must be won, not just this particular battle. The third contribution has to do with setting out some problems with assessing data according to particular approaches such as a reductionist, or operationalist methodology. Instead, it is suggested that a variety of methods may have to be integrated to arrive at criteria which would provide a successful analyses of evidence and definition of terms. This is a contribution because until now most researchers have concentrated on finding a particular correct analytical approach.

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