

**Two decades of Research in Primate Communication and Culture:
A Selective Review**

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Semioticians' interests in non-verbal communication underlie their interest in primates. Most of the family Hominidae, and humans for much of their evolutionary time, have not been the highly verbal beings we are now. It is the focus of these lectures to argue that it is the development of human society that pushed us from highly social, interactive, but non-verbal beings into what we are today. It is not just a long slow evolutionary pilgrimage building on a foundation of genetically-based hard wiring, but the neuro-muscular, cognitive, developmental interaction fostered by our intensely stimulated and complex social lives that have allowed us to develop our incredible communication system. Have you ever considered that if we share 98.point something of a chimpanzee's DNA, how much more we share with Australopithecus who only separated from our line half as long ago? But it is unlikely that these forms were verbally successful. Semioticians study primates to look for patterns in their communicative systems that will inform us about ours. I am arguing that over the last two decades, one pattern has become increasingly evident. Complex verbal communication is based on the socializing process, and a discussion of nine books on primates published over the last two decades is providing the data to support this hypothesis. These books were all reviewed in the Semiotic Review of Books and thus contribute to a semiotician's understanding of the foundations of human communication. Many of these works deal with apes, but several are focused on monkeys and one on human facial communication, to provide a range of data. As the decades progress, the influence of increasing acceptance of primate cognitive skills and their interaction with social development, enhances our understanding of the role of social complexity in the development of communication.

We begin the first lecture material with Cheney and Seyfarth's 'How Monkeys See the World', which poses the interesting question of "how close is a monkey's perception of what is happening to an observer's view"? In other words, "What is it like to be a monkey"? This question needs answers from several levels – the sensory, the motor, the physiological and the cognitive – because all of these levels

contribute to perception. The focus of the book was to attempt to understand how vervet communication systems work. In order to do this, the authors had to study how vervets observed the world, commented on sources of danger, and influenced their young to learn their code in its correct format. In addition to direct observations, there are also implications of more complex assessments such as transitive inference. If A is more important than B who is more important than me, then I shouldn't aggravate A. The potential for assessing such cognitive abilities, based on systematic observations, allows observers to move from description to explanation or, as the authors say, to move from 'knowing how to knowing that'. There are also some compound calls that occur in various combinations of up to four units to indicate intermediate states or referential specificity, particularly in capuchins. The general fact that many monkeys have a large repertoire of vocalizations, and can break down graded systems into acoustically distinct calls and rebuild them into call combinations, suggests a level of organization and intentionality in monkey vocal systems that was previously unrecognized and has potential as an underlying basis for more complex verbal systems.

One of the types of field experiments which was used to assess a level of semanticity was an habituation experiment in which one type of call with a specific referent was played back to the point of habituation. Then another type of call with the same referent was played back and it was observed that the habituation persisted. In other words, similar signals with the same meaning were considered the same but playback of a vocalization with a different referent, even by the same animal, was responded to as a different signal. The meaning of the signal was recognized rather than the similarity of the vocalization. There is no evidence that monkeys recognize or label the criteria they use to classify objects or relationships, but they do classify them. In doing so, they influence what others think, as can be seen by the (relatively) infrequent use of deception, manipulation, and teaching that is observed in monkeys. One point of major interest is the differential importance of the social vs. the non-social nature of a problem, which is much more important to monkeys than it is to humans, or even to apes. Chimpanzees, for example, can combine ideas of social and physical causality unlike vervets who do not seem to understand the implications of a predator's tracks, even though they do understand the implications of the

rank of an infant's mother. This increased level of understanding, due to prolonged observation of free-ranging monkeys, helps primatologists (and those interested in the development of systems) to realize that certain parts of the life experience, such as social vs. ecological factors, may have differential relevance in developing communicative skills.

In the second lecture we start with de Waal's 1989 book on 'Peace-making among Primates' which also focuses on the social causality of various monkey and ape communicative gestures, particularly those devoted to establishing and maintaining social harmony in a group. The interesting factor here is that various species of monkeys, such as rhesus and stumptail macaques, use quite different conciliatory and group bonding behaviours, and also that the nature of these messages differs by gender of the participants. In order for all this to work, reconciliation and conflict reduction behaviour must be developed and de Waal suggests that there is a 'critical period' for learning such behaviour which may differ a little from species to species (rather like communicative gestures). To support this argument, he later published data concerning a group of very young rhesus raised by stumptail macaques (who have a very noticeable set of reconciliation behaviours). By the time the rhesus were five months old they used not the stumptail pattern of reconciliation but its timing, and employed their rhesus pattern in stumptail relevant contexts. The universal nature of the systems was contrasted with the differences in pattern between sexes, between species of the same grade, and between monkeys and chimpanzees, thus demonstrating the importance of systems that develop in a variety of ways, all to achieve the same ends. He presents considerable data on the similarities and differences shown between monkey and ape social solutions to problems. He sends several chapters of the book also discussing the social and behavioural differences between common chimpanzees and bonobos who have quite different patterns of aggression and affiliation, thus indicating that the differences are not really based on taxonomic level of complexity, but on the nature of the social organization.

The third lecture moves on to Chimpanzees which are the focus of other books from early in the decade such as Nishida's 'Chimpanzees of the Mahale Mountains'. Nishida's book provides some discussion of cultural differences in tool use between his population and Goodall's work at Gombe, but focuses on the

conservatism of chimpanzees in this population. This is relevant to semioticians who view culture as a basic learning foundation for the variability that underlies differential codification. If all tool use patterns were governed by ecological factors, then the perceived variability is neither learned nor free but is governed by the constraints of a physical system. Many aspects of communication are governed by such physical constraints, but the ones which are free to develop from social, cognitive and semantic underpinnings are the ones which really provide an insight into cognitive systems. Thus, the tool use differences which are based on free variables of learned pattern or invention are also the ones which reflect more about the cognitive underpinnings of cultural behaviour.

These authors provided a background for a more extensive edited treatment called 'Chimpanzee Cultures', compiled by Wrangham, McGrew, de Waal, and Heltane, which was based on material gathered from the major chimpanzee research presented at two conferences in 1986 and 1991. This book covered an intensive examination of the influence of ecology, sociality, behaviour, competition, and the cognitive base of being a chimpanzee. The cultural aspects included gender differences in food resource exploitation, population differences in grooming practices, hunting patterns, tool use strategies, medicinal plant utilization, and responses to other groups. The affiliative benefits of using non-copulatory sex in bonobos to regulate tension were compared to the more manifest aggression frequently seen in common chimpanzees. The different patterns of sexual behaviour seen in adult and young bonobos, and between males and females, and the variety of social situations in which it occurs demonstrates that it is a highly variable, multi-meaning type of activity with a range of functions beyond the obvious. Use of such a basic behaviour for a range of meanings indicates a level of symbolic input with many social ends.

Another aspect of chimpanzee behaviour relevant to semioticians is a discussion of imitation and deception. How much are animals aware of another's beliefs and how much will such an awareness govern their actions? Do you have to be aware of another's beliefs before true deception can occur? How are humans aware of another's beliefs? One of the ways that this topic is researched in primates is to assess alliance formation. This is a topic which can be observed fairly easily but may be difficult to interpret. Another behaviour which has the same duality is imitation. How close does behaviour copying

have to be before it is classified as imitation? What is imitation – the achieving of a goal or the copying of a technique? In my opinion, the ability to move back and forth from imitation to emulation (the connection between a simple procedure and a meaningful consequence) means that the cognitive aspect of problem-solving is more clearly understood. The development of problem-solving skills and the ability to pass them on has clearly occurred for chimpanzees, and we humans are as much interested in the range of problems being solved as in exactly how the solutions work. Up until this decade, teaching – even among apes – was not a well accepted concept, but long-term intensive observation and time spent considering the implications of those observations is beginning to alter our assessment of ape capabilities.

The fourth lecture covers another area of altered assessment derived from Fridlund's book "Human Facial Expression: An Evolutionary Perspective". Fridlund has openly challenged Darwin's interpretations of facial expressions as indicators of emotion and thus, as a source of information about an individual's possible actions. Instead, he suggests that facial displays are not innately derived expressions of emotion (as so many face analysts have suggested) but are social phenomena derived from the neuromuscular ontogeny which are converted into signals because of their value in mediating interactions. Emotional displays become social tools which arise from the social motives of the displayer and say little or nothing about his or her actual emotional state. Fridlund suggests that as infants develop, they learn to decouple expression feelings from display as they learn social rules. This is very valuable in complex social situations because the displays then come to stand for (are reified as) states or contexts rather than indicating possible action (e.g. "I am angry" vs. "I am going to hit you"). Thus, social etiquette is served since the receiver has an opportunity to respond to the state rather than having to deal with an overt action.

For semioticians, this approach, which is so contrary to Ekman who for over twenty years dominated the literature on cross-cultural studies of inherent emotion, is quite new. Fridlund supports his arguments by examining the neuromuscular connections of facial muscles and tying these in with whole body musculature. He says that we read faces because we have learned to attend to them rather than that they provide indicative information, whether unconsciously, under a level of concealment or

transmitted as an active social gesture. Humans do not need the actual presence of others to have a social response to displays because we are such social beings that a television program or a picture of another human, or even an animal, will evoke a social response. This book continues by discussing the potential for 'cognitive empathy' in a wide range of primates and particularly noting its presence in chimpanzees. In human children, 'cognitive empathy' occurs at about the same time as mirror self-recognition, which is seen as a basis for operationalizing an understanding of self and others.

In a work which allows comparisons to be drawn to human children, the pragmatic use of communicative gestures among baboons is part of Barbara King's approach to understanding how young baboons actually acquire the information they need to develop and survive in their world. In her book "The Information Continuum" she discusses the differences between passive information acquisition (just observing) and actively eliciting information about the world, both social and physical. In some cases, more experienced animals actually direct action towards younger ones in such a way that the young can learn. These actions may not be intentional. The difference between the two situations is very important because the concept of 'intentionality' is one with major cognitive ramifications, especially when applied to monkeys. If a monkey is considered to act intentionally it is considered to have an understanding of the mental state of the other and to be acting in such a way as to change it. In terms of cognitive interaction, intentionality would distinguish between observation, information donation, social learning and actual teaching. This can be accepted in a few cases for apes, but there is considerable controversy over whether or not it is seen in monkeys. Distinguishing stages of intentionality in non-verbal beings requires very careful experimental procedures.

This question of how similar human minds are to those of Great Apes is the basis for "Reaching Into Thought: The Minds of Great Apes" edited by Russon, Bard and Parker covered in the fifth lecture. This is a major compilation of material on all four species of great apes kept under a wide range of conditions. The book examines underlying intellectual abilities by looking at tool use, social dynamics as a source of intellect, and the development of object concepts, causal reasoning, and Piagetian stages. Of particular interest are the insights provided by third party interventions in social conflicts where some

animals put themselves at risk to re-establish social harmony in the group and do so without becoming emotionally involved in the situation. In addition, the use of eye contact and indicative gaze direction by gorillas is claimed to be a reflection of “the expression and attribution of intentions to others”. This is a level of meta-cognition which I personally would not confine to gorillas but would expand to a range of primate species. In terms of semiotics, gaze direction and fixing of attention are important markers indication intentionality. The book goes on to discuss a wide range of cognitively complex behaviours such as imitation, tool use, mental counting, deception, and categorical skills. The important aspect of this discussion is the idea that such complex behaviours are recursive and influence each other. Apes develop their patterns more slowly and less recursively than young humans. Thus, they are often 7 or 8 years old before they move from first to second order representation whereas children have collapsed developmental stages which allow the two systems of physical cognition and logico-mathematical cognition to influence each other, allowing triadic learning to occur. As a result, metarepresentation, proto grammar, and a set of understandings about the self can begin to develop in children even before brain growth is complete.

The apes who are closest to humans in these complex levels of development are those who are enculturated in human environments are treated as intentional beings. The sixth lecture covers one ape in particular who had this life experience is Kanzi, the bonobo subject of “Apes, Language and the Human Mind” by Savage-Rumbaugh, Shanker and Taylor. In fact, the main difference between Kanzi and his two sisters, who were not so successful in learning a human language system, was that he was a freely interactive being while they were caged. Savage-Rumbaugh has said that the need to get ideas across to Kanzi, because there was a major potential for injury to occur if he did not understand, made everyone involved in that project very intent on communicating clearly and functionally. You could not just walk away from a communicative interaction if initial communicative efforts were not successful. Kanzi was not trained formally to use lexigrams, but he observed his mother and the researchers doing so for 2½ years and then when his mother was removed, he was in a position where he had to communicate for himself. In one day, his lexigram use went from 3 to 12 (all there were) and his frequency from 12 to 120. It was

clear that production and comprehension were separated, with comprehension being much superior. Because of the difficulties of using a lexigram board, the researchers used a lot of vocal English and Kanzi demonstrated that he could understand over 600 novel sentences by the time he was 9 years old. He can even understand what is said to him over the telephone which reduces the facial and gestural cues to nothing. After his two sisters, who were cage-raised, were observed to have so much trouble in learning, his third sister Panbanisha was raised freely, interacting with the researchers and the language board, and her abilities match Kanzi's quite well. It seems very clear that raising conditions, treatment as an intentional being, and strong motivation to succeed by all concerned can have a profound impact on how well a complex cognitive task such as language acquisition will occur. It is not just the intellectual abilities of the participants but the social conditions of learning and the social relations between teacher and learner that appear to make the difference between Kanzi and his unsuccessful sisters who had the same parents and lived at the same place, but in different social environments.

In Barbara King's book, "Origins of Language" she approaches language not as a static set of features, but as a dynamic interactive system of production and reception. Her book is an edited volume which includes researchers from a variety of disciplines such as primate behaviour, linguistics, primate neurology, and child behaviour. This approach attempts to cover a range of information underpinning the complex form of communication that we call human language. Neither human language nor effective primate social communication skills can develop in a social vacuum. Experiments have revealed that compared to isolation reared and deafened songbirds some aspects of primate predator alarm calls are quite hard wired, which would be relevant for survival in young animals, but calls with social implications must be learned and develop throughout the maturation of the primate. This is true even in the trills of pygmy marmosets (New World Monkeys) who develop individual markers in their calls, and modify their output to be more easily located as individuals move farther from their troop. In terms of social influences, captive pygmy marmosets who were initially strangers both modified their trill production after being placed together for some time. The importance of social facilitation is emphasized by Marstripieri's experiments in which the more affiliatively organized stump-tail macaques had a much wider and more

complex patterns of affiliative intent than is the case in the more dominance oriented rhesus monkey. Some authors in King's book are more interested in the status of neurological circuitry in primates and humans than in the comparability of behaviour. Gibson and Jesse are two of the researchers who utilize this approach and their argument is that the size of the neurocortex relates to the complexity of the functions of the part controlled by that area rather than its size. The interconnectedness of motor neurons leads to a much more complex ability to integrate information, thus underlying the cross-modal integration that supports the human communication system. However, they argue, this is not a qualitative difference between the human and primate brain, but one due to an exponentially increased level of complexity due to the larger human neurocortex. Words depend on mental construction skills learned by association of sound and object. Gestures and vocalizations used to process foods or indicate travel directions may have provided a foundation for word-object associations and as the size and complexity of the neurocortex developed over hominid evolutionary history. Those who developed increasing numbers of neurological connections would have had a serious survival advantage. The advantage does not lie in gesturing or vocalizing to oneself but in the social impact of such behaviours. This is based on the argument that production and reception must have developed concurrently since one is not much use without the other, even though ontogenetically reception does seem to develop first. The final authors in this book lay out arguments discussion how originally continuous gestures could have developed into discrete digital forms through the stylization process of ritualization. This would have provided a foundation for digital vocal signals as well which may have become much more refined and useful in the increasingly complex world of early hominids.

The final work covered in this series of lectures brings us back around to the complex information transmitted by monkey vocalizations, which is in some ways where we began, but almost 20 years farther along in our understanding. Cheney and Seyfarth again went out into the field in Africa to look this time at the complexity of baboon social life and communication abilities. They started by observing baboons in the Okavango swamp region of Botswana, which is a challenging habitat for baboons, given its alternating periods of droughts and floods and its rather sparse tree cover. In the 20 years since their vervet work the

concept that mental capacities in primates were driven by increasing levels of social complexity has become more and more accepted. Instead of investigating ecological pressures such as predation driving communicative syntax as in 'leopard' and 'eagle' calls they now conducted field experiments to determine whether baboons understand the implications of social relationships. In other words, do baboons do more than respond appropriately to social cues? Do they understand the implications of social interactions between other animals? In fact, can they see the world through the eyes of another baboon? This "theory of Mind" concept has been investigated in Apes who seem to have demonstrated self recognition in mirrors which implies a sense of self concept. But arguments for this ability at the monkey level are considerably more murky. Cheney and Seyfarth support the "Social Intelligence Hypothesis" originally developed by Allison Jolly and conducted field experiments on their study population in an effort to explore how baboons perceive their social world. These experiments reveal that by vocalizations alone (since the stimuli were previously taped call playbacks) individuals were able to recognize other individuals, know their status and kin relationships and respond noticeably if the playback sequence does not conform to their mental view of the social network. Their work suggests that baboons have a concept of both the target and the motivation of a signaller. This concept of signalling 'intent' is a very complex one to assess in animals who cannot be asked directly what they intend. The whole aspect of 'self awareness' is a multilevel one, even among humans according to William James. Cheney and Seyfarth compare their observations on baboons to experimental work with young children and to work with other social species of animals such as dogs and ravens. Their results argue that each baboon sees itself as a 'unique social being' which seems quite close to self awareness even if they have not passed the Gallup mirror self recognition test. Their conclusion is that the level of cognitive complexity revealed in baboon communication systems strongly suggest that baboons have concepts for which they have no words, which is a very different way of looking at the development of language than is espoused by those who argue that we need the terminology first in order to pin down what we are thinking about. It is by observing social animals in an undisturbed social milieu that we can begin to parse out what they know, how they know, and why they know, what they do, as well as how that knowledge is transmitted. My own work from

the 1970's on visual communication codes has always supported the argument that primate communication has a multilayered meta-communicative level of content that provides the level of social context to a message which is such an integrated aspect of human communication that we hardly recognize it.

This is a very relevant aspect to understanding how and why complex communication actually functions. Primatologists have always understood that the social milieu in which primates live is a vital aspect of their development (witness Harlow's experiments) but it has never been so clear that the quality of social environment can have such a profound impact on the development of what is usually seen as a mainly intellectual cognitive function resting on a very genetically determined base. If cognitive development is so clearly intertwined with social factors, then human development has been more of a process of social self-domestication than we probably ever realized.

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