The Face as Interface

Human Facial Expression: An Evolutionary Perspective. By A. J. Fridlund. San Diego: Academic Press. 1994. 369 pp. ISBN 0-12-267630-0.

The Information Continuum. By B.J. King. Santa Fe, New Mexico: SAR Press. 1994. 166 pp. ISBN 0-933452-40-3.

One of the main theses of Fridlund's book, that facial displays are not innately derived expressions of emotion, but are social phenomena derived from neuromuscular ontogeny, which are converted into signals is very much at odds with the major theoretical position held by Paul Ekman and Irenaeus Eibl-Eibesfeldt that facial gestures are innate aspects of communication. Fridlund supports his position by an extensive analysis of the neuromuscular underpinnings of facial expression, supported by an analysis of the interruptions that occur as a consequence of particular brain lesions. This viewpoint, to some extent, reaches back to Darwin's approach that while the facial movements themselves are governed by nervous circuits, the social knowledge that turns them into meaningful signals must be learned by both humans and other members of the animal kingdom, particularly primates. Higher primates and humans have much more complex facial musculature and innervations than other animals so the potential for a much more finely graded system of movements exists. This, coupled with the more complex interactive social lives of primates and humans, provides an adaptive advantage for learning the underlying messages sent by minute and complex facial movements. Fridlund strongly argues that the production of particular facial gestures can arise from varying emotional states. For example the production of tears (or primate 'cry face') can arise from shame, grief, pain, rage or overwhelming joy. Thus he is arguing for the decoupling of emotion and gestures in the individual, but also for the need to learn social rules for the effective comprehension of facial gestures as communicative tools. However, the social motives served by the gestures are not necessarily at the conscious level. Much learning of cause and effect can occur subconsciously and this may easily be the situation in many animal species. Fridlund supports this controversial position by including an extensive cross cultural analysis done by James Russell in which the argument for decoupling universality and innateness is advanced. The social motive of displays undermines the argument that they are innate hardwired reflexes which occur totally in reaction to the sender's emotional state. The transition from regarding facial gestures as an indicator of emotional state to a technique of social interaction brings such gestures squarely into the realm of semiotic discourse.
The second book covered in this lecture, The Information Continuum by B.J. King, provides a practical example supporting Fridlund's position, although it was written the same year and without such intention. King's book supports the argument that the transfer of information in primates (in this case baboons) occurs in social situations. The information transmission does not have to be in an active interaction although it frequently is. She discusses four levels of information transfer: passive observation, information donation, learning and teaching. As I thought about these two books I could see how Fridlund's approach of a basic system of movement permitted by a particular configuration and ontogenetic origin of parts, and being constructed into

meaning by observation and shaped interaction of an infant with other animals, tied King's information donation idea in with the social construction of communication. 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 or 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. In terms of cognitive interaction, intentionality would distinguish between observation, information donation, social learning and actual teaching. King supports her theoretical position by examining what we can understand of Australopithecine social communication by examining their material remains (stone tools) and by how modern children learn. Modern adult humans donate information constantly to children as well as participating in active teaching. This is the end of a long pattern which began much more heavily weighted at the passive observation and information donation end of the spectrum in our primate ancestors. To me, Fridlund's work provides an underlying basis for understanding how the patterns King suggests could actually function.

These two books, on the surface, are very different from one another but both about information and the transmission and coding of information. Fridlund's book *Human Facial Expression - An Evolutionary View* is a technical discussion of how the human face is put together and what kinds of messages it sends. His views differ widely from most work done in the last 50 years, even though he harks back to Darwin as essential work which freed the study of faces from theological causality and allowed a scientific study of visage to begin. *The Information Continuum* by B.J. King is a discussion of the difference between, and evolution of, information donation and information acquisition. King is a primatologist whose focus is on the juvenile stage of learning seen both from the passive and the active perspective using baboons as her model. How do those who know transmit information to those who do not? Where is the boundary between learning and teaching, between primate and hominid patterns of learning communication skills?

I will begin with a discussion of *Human Facial Expression* and the early Darwinian idea (Darwin 1872) that the expressions of the face and the emotions tied humans to the animal kingdom. This was a radical departure from the ideas current at the time that human facial expression was perceived as discontinuous from the animal world and a mark of divine creation. Darwin's opposition to this was based on the idea that expressions had no function. They were non-adaptive movements of the nervous system, because to argue that facial expressions had evolved to communicate supported the argument of divine design. If animals did not have expressions in order to communicate emotion then they must have had them for some other reason either as a preadaptation or as a vestige of some other activity. Darwin's arguments concerning the source of these expressions suggested that they were mainly due to accidents of nervous system organization: the serviceable associated habits, overt manifestations from an overly stimulated sensorium or the Principle of Antithesis, which were the three sources of expressive movements he postulated. In many cases, according to Darwin, these movements had become reflexive, and because he found them in animals and across the human

populations of the world he postulated that they had been useful actions at a very early evolutionary stage, but that their usefulness had atrophied over time (such as lifting the lip corner in a sneer which in the past might have revealed a weapon-like canine tooth, but for current humans was of no practical use). Darwin did believe that you could consciously copy these reflexive habits for communicative ends, but that this was the only way an adaptive communicative habit could be established. This however, implies willful intention and, as Fridlund notes, this is not a level of control over facial expression that is currently accepted for non-human primates. The basis of the human face as nerves, bone and muscle has a large genetic underpinning, but this is not the main issue in studying the product (the expression). In order to demonstrate that smiling is controlled only by genetic influences you would have to isolate the neuromuscular circuit that caused it and demonstrate that stimulation of this circuit caused smiling, destruction of it eliminated smiling and that smiling could not be learned. But smiles are not stereotyped in intensity or form. They appear in precise patterns in social interaction and their elicitation may show brain lateralization to the right side, parallelling the verbal channel lateralization to the left side of the brain. Fridlund spends Chapter 3 discussing what types of evidence might be used to infer a major genetic input into facial expressions. In fact, he discusses many sources for visual displays, such as homology, learning, phylogeny, association, selection, andhypertrophied behaviour, and comes to the conclusion that Heinroth's idea of intention movements plus what he calls social instrumental habits are the probable source of displays. This differs from Darwin's approach because for Fridlund, emotions have nothing to do with facial displays in either a causal or accompanying sense. Instead, Fridlund insists on analysing both the sending and receiving of displays, emphasizing their interactive nature and how response to displays is exceptionally important for social species (like humans) because displays are useful in predicting another's reactions. Thus humans (and primates) are sensitive observers, selective about display components and often sceptical about their meaning. The visual scan pattern that human infants develop very early (1 - 2 months) focuses on the eyes and mouth as two of the most informative facial regions. The presence of neo-cortical cells which respond specifically to pictures of faces of individuals of one's own species in a wide range of animals suggests the phylogenetic underpinning of the interactive importance of attending to cues. On the other hand, human faces are moving all the time, eating, talking, breathing, living, but we do see that split second display - alarm - distaste - fear or joy which an interactant will express. How do we sort out individual and irrelevant movement variability? How is display coded to be received? In song sparrows and some monkey species (Japanese macaques, pigtails and vervets) different species respond to differing aspects of vocalizations and seem to perceive them better in experimental situations. An early high pitch peak in a coo vocalization is easily distinguished from a late high pitch peak by Japanese macaques, but not by pigtail macaques. The pigtails discriminate between pitch differences in varying inflectional changes much better than early peaks versus late peaks in frequency. However work on facial displays is practically nil because it is very difficult to sort out the patterns experimentally. The main procedural testing we use is in deception studies even though very few of these have focussed on the facial coding which underlies successful skepticism. Humans (and others) must be very vigilant to discern important relevant displays, but be aware of the costs involved in attending to every movement of another as if it were relevant.

A comparative study of morphological rather than behavioural traits is more likely to help assess why there are cross species similarities and differences in pattern, but these studies must begin in early ontogeny, due to allometric influences in muscle attachment and bone shape between humans and other species. This material is addressed in Chapter 5 in which the lateral division of the lower face is accounted for as arising from the bilateral branchial arches. The upper face arises from the fronto-nasal prominence which folds down from over the brain until it meets with the two sides of the branchial arches fusing around the mouth opening. Thus the upper face and the two sides have independent nervous enervation because they arise from independent underlying structures. If facial development is normal, they fuse seamlessly, forming the skeletal and muscular basis of the face. Most facial displays arise from the action of about 20 superficial muscles which tend to originate in bone but insert into facial skin, which provides facial mobility. The deep facial muscles have a different embryonic origin, developing from the mandibular arch (part of the branchial arch) and both originating from and inserting into bone. These are mainly the muscles of mastication, but they are large powerful muscles whose actions can also have signal value (such as in clenching the jaw). These muscles of different origin are mainly enervated by 2 major nerves, CN VII for superficial and CN V for deep muscle which divide into a number of branches. Facial sensations also funnel into these nerves to complete the circuit. The branches of these nerves arise directly from the brain in four major groups which serve different facial regions. The facial nerve nuclei are not merely relay stations according to Fridlund, but act as "intelligent controllers" because they are closely tied by a dense array of interneurons allowing complex control of the configuration of facial muscles. They are also influenced by the direct impact of sensory input allowing direct elicitation of facial acts - and this circuit may actually be the basis for what are called facial reflexes. This pattern is complexified by which area of the face the 7 nerve branches influence. The lower part of the face (deriving from laterally differentiated branchial arches) is decidedly contralateral(eg. right brain, left cheek). The upper facial muscles around the eyes have both contralateral and ipsilateral control (same side). These neural features do not markedly influence facial displays in normal (non damaged) individuals, but show up clearly in cases of injury or pathology. The interesting factor is how they represent the overall bodily pattern of general bilateral control of muscles closely associated with the trunk versus increasingly contralateral control of more lateral muscles, such as in hands and feet. This is of considerable relevance when we consider the potential confusion that could arise from lack of hemispheric dominance when considering possible contralateral enervation of a midline (but laterally derived) organ such as the tongue.

In addition, various pathological studies indicate a third source of neural control of the face arising from the (loosely defined) extra pyramidal motor system. Facial paralysis arising from lesions in different areas can either spare facial reflexes, but not allow voluntary movements - or allow facial movements to be made to command, but otherwise faces are mask-like and largely immobile (reverse facial paralysis). This pattern seems to be parallelled in speech pathologies as well with "apraxia of speech" not allowing the construction of sentences, but "automatic speech" allowing the rhyming off of over-learned words and phrases (like counting, days of the week etc.) even though when patients are asked afterward they cannot say what they have done. Various pathologies can allow either one of these skills to be retained while eliminating

the other. This pattern of dual control is also seen in motor problems such as "ideomotor apraxia" in which basic musculoskeletal function is uncompromised, but patients cannot execute simple motor acts on command. The generality of this pattern suggests that faces are not constructed especially for expression of emotion, but on the same general pattern as the rest of motor behaviour, with a dichotomy arising between constructed movements (decided on each time) or over-learned movements which continue once set in motion.

Fridlund goes on from this point in his argument to discuss facial reflexes, and the possibility of analogy as a source of particular facial displays (you equate feelings about two things and approach them with the same expression). He also discusses the potential for reinforcement and therefore learning of particular facial movements out of the random ones occurring in congenitally blind neonatal humans, to shape their facial expressions, in contradiction to Eibl-Eibesfeldt's view that these facial expressions are innate. It is one of the major theses of this book 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. Displays are specific to intent and context. Thus, there are no prototype facial displays in this system. Each display is in the context of issuance and if, for example, the context is agreeing reluctantly with a dominant individual - the smile projected would probably be called a "false smile" by Ekman's "Emotional View," suggesting the smile masked another emotion, whereas for the "Behavioural Ecologist" the smile would be labelled an "about to appease" display. This makes displays social tools, which arise from the social motives of the displayer and are shaped in a co-evolutionary way with the recipient. The recipient must attend to cues for the display to transmit information, and those cues most attended to, will become most ritualized. This argument supporting a non-emotional basis for facial display is supported by a discussion of theories and concepts in Chapter 8 contrasting the "Emotional View" with the "Behavioural Ecology View." One of the topics Fridlund discusses is why in so many cases where emotional response might be assumed (such as praise or harsh criticism) the receiver will retain a motionless face (which is sometimes interpreted as being indicative of strong emotion). Also, in many cases displays such as a "cry face" can indicate any of sadness, grief, rage, or overwhelming joy. These responses are often culturally driven, and may also vary widely on an individual basis. Hinde (1985) and others (eg. Tinbergen) have long suggested that threat displays usually occur in situations of ambivalence rather than anger. The display is not a simple readout; it should be more often expressed in situations of conflict in intent because it alerts the other to your potential for damage, (size, (piloerection), size of teeth (yawn, threat) etc.) without committing the individual to attack.

"That signals serve social motives does not imply that they are learned; an innate social cognition that mediates juvenile or adult displays, is more reasonable than the supposition of affect programs" that must be developmentally unlearned or culturally constrained" (p 139). Even infants use displays as a method of gaining the caretaker's attention and use displays at optimal times to urge caretakers into action. As a child grows the "Emotional View" suggests that infants learn to decouple expression feelings from display as they learn social rules. The "Behavioural Ecology" approach suggests that children as they grow become more skilled at determining the most useful

environmental context in which to unleash social displays. For example, the function of crying is to signal readiness to receive attention, rather than to express sadness. The contrary argument to this is what about expression of facial displays in solitary conditions? Ekman and others have conducted studies of social versus non-social situations and assert that facial displays occur in both cases. However, Fridlund says that to suggest a person is socially alone when watching televised input would be news to many watchers of soap operas who become intimate acquaintances of the characters in the stories. What about photographs? Are they not cues to the reconstruction of past interactions? People who respond to TAT cards and ink blots are not responding to the physical objects but to the social memories they release. In Chapter 8, Fridlund suggests 5 reasons why the physical presence of others is one of the least important criteria for ascertaining the sociality of displays as well as discussing audience effects, the physiology of facial displays and studies of the effects of facial behaviour in determining emotion, as well as the inadequacy of self report as a criterion.

In Chapter 10 he presents an analysis of cross cultural studies by James Russell who was working on the problem of display universality while Fridlund was writing this book. Fridlund argues that the rise of relativism in the 1960's is being counter-challenged by many studies suggesting evidence of universality (such as Derek Freeman's refutation of Mead's Samoan work). It was assumed that finding universality of expression would imply innateness, when in fact, many factors (such as human social nature) would decouple universality and innateness (ie. it is not innate to believe in a god, but it is close to universal for humans to have religious ideology). Russell reviews the cross cultural studies from the perspective of sample size, mode of test presentation, nature of stimulus, theoretical background, and variability of results leading to discussions of internal validity and convergence of method. The "standard method" set up in the 1980's was by no means used in all studies. Also, the conclusion of universality is not supported by similar results from an array of methods. Russell analyses the "standard method" and discusses why it had become the method of choice. His interpretation is that posed facial expressions - labelled by the researcher and responded to by forced choice answers - would produce positive results which were what researchers wanted. When the standard method stopped working in first studies of isolated cultures, it was altered to the Dashiell technique in which a story was substituted for the emotion name as a choice response. In fact, Russell concludes, we might get more information by gathering data on how members of other cultures conceptualize emotional and facial behaviour than by trying to decide whether they are right or wrong or agree with us. Fridlund uses Russell's results that innate universal patterns are not demonstrated, as a basis for examining universal and regional variations in facial expressions. First he investigates the neuro-cultural theory which is explicated as a two-factor model: innate hard wired patterns of facial movement and internalization of social convention. Ekman had integrated these two into an explanation that allowed both universality and individual control of expression, but did not take the social aspects into consideration. This approach appeals to the idea that we have a natural "honest" indigenous "facial affect program" which reveals our authentic self while admitting that worldly constraints and culturaldisplay rules may sometimes force us to cover this "innocence" with social faces. Fridlund counters this approach by examining human facial paralanguage and gesture looking for "basic facial affect" and the "authentic self". He does this by

assessing the types of human facial paralanguage such as emblems, self manipulators, illustrators, regulators, speaker illustrators, speaker comments, and adaptors. By looking at the probable functions of paralanguage, Fridlund argues that all of these types are social modifiers, while only a minority of displays have any conceivable relation with emotion. We have a long way to go in trying to formalize paralanguage. However, some patterns that we exhibit in the paravocal system such as frequency declination and final fall at the end of an utterance are also observed in vervet monkey vocalizations. In humans "final fall" in pitch often precedes a shift to another speaker, and in vervets as well, it tended to preceed interruptions by other monkeys.

This level of commonality underlies the importance of communicative gestures in mediating social interactions. We still have not absolutely understood the sources of facial displays, but are constructing the kinds of questions which need to be answered in order to clarify the issues. However, Fridlund claims that "in nearly all cases in which emotional expression occurs there is an intention or social motive, embedded in a given social context to which the display can be better attributed" (pg. 277). Even in cases where lone viewers saw similarly pleasant scenes but two had animals while one was an ocean, the animal scenes elicited more smiling, which Fridlund interprets as social interaction in a broad sense. He suggests that many emotion terms are really reified descriptions of actions, contexts, or intentions. The reifications serve social etiquette since they express states rather than possible actions (eg. "I am angry" versus "I am going to hit you.") Thus a practical approach suggests that analysis of displays will lead to a taxonomy that predicts classes of observable behaviour rather than depending on progressively finer distinctions between emotions (contempt subdivided into derision, sardonicism, distain, scorn, moral outrage, etc.)

It took me some time to accept this argument, but as a primatologist it is more congruent with the interpretation of primate facial expressions. It is clearly incorrect to say that a threatening monkey is "angry". It may be using a threat to project that internal state, but it may also be a social control gesture, a startle response, part of a dominance interaction or a response to a non-cooperative object (like an electric fence). Threats occur in bluff and play as well as serious indicators of potential aggression. In many cases the kinds of threats - bared teeth open mouth display, yawn threat, mouth protrude threat, eyelid blink, open-eyed stare, are very much modified by context and the social factors of the interaction. The same can be said for lip smacks which occur in social, sexual, approach, appeasement and play as distance reduction indicators and a wide range of other private facial displays. Primates learn their facial displays, both the details of form and the context of their use. Young primates can be seen by themselves repeating facial gestures repeatedly as if they were practising them.

This comprehension of the pragmatic use of display gestures is part of King's approach to the transmission of information in her book, *The Information Continuum*. The juvenile baboons she studied are responsible for obtaining most of the information they need to deal with their physical and social world by passive information acquisition (just observing). In only a few cases do they have an active role in eliciting the behaviour they need to learn about. However, one clear instance of this occurs when infants or young approach aggressive adults, and are restrained or retrieved by their mothers. If this happens repeatedly the youngster "will get the message" to give the older animal a wider

space. Information donation occurs when more experienced (read older) animals actually direct action toward younger ones in such a way that the young can learn from this. This may not be the intention of the older animal, but the effect can still occur. King divides the transfer of information into four levels, social information transfer, social communication, learning and teaching. Social information transfer occurs anytime that interactions increase the probability that one individual will come independently to exhibit behaviour initially in the repertoire of another. Social communication can be emotional or referential, concerning internal or external states. Referential communication does occur in primates to some extent and can be honest or not. It is difficult to deal with the question of intent since it also occurs at many levels and King sidesteps it because it does not affect the quality of the information transferred. Social learning is seen as the direct result of social interactions and is very difficult to determine in free ranging primates because it requires observation of the first behaviour of that type by a naive animal. Teaching does occur in nonhuman primates (which is a change in our understanding over the last 10 years) but it is very rare. Teaching can be classified as behaviour sent by A, at some cost or no benefit, modified in the presence of the immature B, directed towards B, encouraging a particular activity or punishing B so that B acquires the knowledge or skill earlier more rapidly or efficiently than it otherwise would have done. This can be seen in mother chimpanzees in the Tai forest repositioning the hands of their infants on stone nut cracking hammers, slowly repeating behaviours until the infant's level of behaviour improves. A similar type of episode was also seen in Gibraltar Barbary macaques where the head male was seen to lie on his ventrum, teeth chattering to a 4 to 8 day old infant who attempted to crawl towards him. As the infant crawled, the male backed up a little, encouraging the infant to continue toward him. He then socially reinforced the infant's efforts by picking it up and teeth chattering (a social reinforcer). Infants with this experience learn to walk earlier than infants who do not get it and at 6 weeks are more competent climbers than those in a similar group without male encouragement (Burton 1972). Thus all 4 of these levels of information transfer occur in nonhuman primates, but the most frequent would be information acquisition by the infant.

In the foraging context, as discussed in Chapter 3, many levels of information transfer occur. These include passive observation, information donation, social learning and teaching. The infants can learn by passive observation, and by co-feeding with an adult. Whitehead's (1986) study in Mantled howlers indicates that infants watch their mothers to see what leaves they eat which is particularly useful to them because leaves are more toxic than fruit in their habitat. Patchy food distribution may also require learning where to look for food as well as what to eat and how to process it. Infants can actively seek information by sniffing the muzzle of a feeding adult presumably for olfactory cues, and sometimes for a taste. The adult may allow scrounging of food, bits that he/she has processed which seems more frequent for hard to process food, or even actively share with a youngster. This may qualify as information donation. Conversely adults may stop infants from eating certain food by removing it from their hands or mouths, or by threatening them when they pick up certain items. King suggests that muzzle sniffing of an animal eating an unusual food could qualify as social learning if the youngster then found some of the same type of food to eat. She gives some examples of this among young baboons and suggests that more episodes of muzzling should be closely examined to see if eating the same food occurs statistically more often than not after muzzle

sniffing. Actual teaching in the foraging context is very rare, but the modification of palm-nut cracking by using stone hammers referred to above among chimpanzees is among the major evidence of teaching among primates that has been observed. This behaviour is not acquired easily. It needs observation, long practice, social facilitation, object facilitation and active guidance before young chimpanzees become proficient nut crackers. On the other hand, some young females whose mothers were not very successful at nut cracking did acquire the behaviour, although it took a longer time than usual. Thus direct teaching is probably not necessary to acquire the behaviour but may facilitate its acquisition. Chapter 3 outlines examples of these four methods of information transmission and discusses their relative frequency and apparent usefulness to the infant.

In Chapter 4 the common ancestry of modern apes and hominids is discussed in terms of the differences appearing between the developing lines. Early hominid evolution of intelligence and technology could have allowed more information to be transmitted to immatures. King discusses Lieberman's assertion that monkey calls are not produced voluntarily and disputes it with evidence from apes and monkeys. There is no actual play-back evidence of referential communication for apes, but a number of experiments with vervets and macaques indicate that they can make both object and social references in their calls. If monkeys have the beginning of referential communication the system must surely be present in early hominids.

It is at this point that I began to tie the two books being reviewed together in my mind. If there are two systems controlling the production of facial displays, one controlling constructed pattern and the other controlling over learned patterns, then is it possible that the development of constructed calls and constructed facial gestures in primates could have begun slowly at an early phylogenetic level? The systems could develop independently from the very basic reflextype response, such as screaming when frightened, evolving in response to the nature of the adaptive stresses imposed on them. As young primates watched their mothers interact with other adults they would observe facial gestures or the use of vocalizations in context and modify their own productions to match more closely. This development could overlay the basic level of movement and vocalization that had been derived from the primate-nonprimate phylogenetic past. Australopithecus may have had referential vocalization, but not yet any kind of speech. However, as the need to receive and decode vocal input became more and more relevant the speed and complexity of the coding and decoding system could increase until we have the current speech processing capability of 15 to 25 sounds/second which Leiberman quotes as being so much more advanced than the information decoding rate of 7-9 sounds/second that occurs for other noise. The relevant factor here is that both production and comprehension must develop together. One of the major problems we have had in studying this topic is that most of our information on comprehension has been deduced from what we can learn about the output system.

In developing hominids the early evidence we have arises mainly from material remains of stone tools and bone associations. We have evidence of material, modification, and some indications of use. We turn to primate modelling to study how problems of foraging are solved with simple tools and then speculate about what value this would have to early forms. As hominids develop their material culture is developed and manipulated to display social symbols in

appropriate contexts. The question arises, "Can style help us to understand social information transfer?" Is information acquisition by an observer going to be enough to transfer the information or is a more complex level of information donation required? King goes on to discuss stylistic aspects of tool types and early art as an information basis for social decision making. At this stage the information being transferred by the objects is totally unrelated to their actual function and we are firmly in the realm of human ideation.

In Chapter 5, King examines modern human learning patterns. Some skills are acquired by children from direct verbal instruction, by direct nonverbal instruction, or merely by observing and trial and error. A distinction is made between the proximate and ultimate aspects of knowledge. For humans, children in play groups help transmit culture and older siblings provide social referencing for younger ones. Returning to the primate models, it is difficult to infer ultimate cause of behaviours such as tool use, but quite a bit of information can arise from examining the proximate level. Tool use appears in some environments in captivity, much more than in the wild. The animal's abilities are not radically different, but the conditions are (more leisure time, boredom, problem solving situations etc.). The same can apply to information donation . The capacity may be there but is not elicited. Monkeys can donate information, but apes who are supposedly more advanced do not do very much of it. The question becomes, "what ecological conditions lead to information donation? King argues that variability in food resources may be the key. If a tool can be used to help extract a non-seasonal resource, then as forms become more responsive to their environment (intelligent) they can begin to associate tool use with seasonally available resources, and youngsters can learn this by watching their mothers. King argues that "tool aided extractive foraging does not need to relate to cognition, but to increased information donation" (122). Tool use needs guidance, but the capacity for it must already be there. If the capacity is there, a combination of ecological needs and the development and transmission oflearned patterns of behaviour will allow it to be expressed. Chimpanzees and Australopithecus had long juvenile periods in which to learn, and faced ecological conditions which made tool use very adaptive. More advanced hominid young need more information to operate in their more complex systems and thus need more input from the mature individuals of their group. As an example, chimpanzees seem to be able to attribute knowledge and mental states to others. They respond appropriately to humans whom they have observed to have the opportunity to know the correct answer, and not to those who they can tell are ignorant (were out of the room when the treat was hidden). Understanding attribution aids in information donation, especially in complex tasks because the knower can tell what part of the task the learner has not yet mastered.

As hominid communication improved, the usefulness of understanding and expressing attribution would increase. A similar pattern is seen in a number of tasks requiring sustained attention and long term practise by social primates. Tool aided foraging, complex communication and fission - fusion social organization are three behaviour categories all present in chimpanzees and presumably in early hominids. King uses these arguments to support the position that quantitative rather than qualitative differences exist in social information transfer when comparing one species to the next. Science requires a theoretical framework based on for regularities of pattern in order to frame arguments. The relevant question is whether continuity theories can account for

novel properties in human behaviour and she argues that if you use human abilities as part of the data set rather than the yardstick of measurement they can be accepted as part of the range of communication adaptation available for primates. A parallel to this occurs in the primate ability to categorize, and communicate to others, aspects of kinship, which does not mean that they have the conceptual ability to discern "bilateral cross cousin marriage". Language is part of a radically evolving mind. Even though Burling claims that "it is implausible that language arose from a primate communication system" (pg. 135) it is clear that message transmission, social categorization, and idea development can occur without language. The questions of what do primates do and how did their behaviour change over time are as significant as how different they are from humans. King argues that degree rather than kind of behavioural ability is the criterion of demarcation between ape and human. Humans have bigger brains - they can hold more pieces of the puzzle at any one time and build a bigger, more complex picture (such as making tools of subparts). Procedural knowledge can be passed on without language. Planning based on declarative knowledge involving anticipation of results requires language. Between these is a level of planning not based on declarative knowledge that requires a fairly complex understanding of cause and effect. The path of continuity between these levels does not claim that apes can do what humans can, but rather that their learning and teaching patterns differ markedly in form from the human system and yet still have recognizable attributes such as categorization, turn taking, predictability of pattern, and social relevance. Humans have taken their abilities founded on these patterns much farther than any other primate. They have developed new planes of complexity, but these are founded on underlying principles that arise from ancestral forms and are present in our nonhuman relatives.

In many ways this argument parallels that made in Fridlund's book, that we have spent a lot of time looking at human facial behaviour as distinctive, instead of at a whole system of muscular and nerve control that shows similar patterning over the whole body. Faces are communicative because we have learned to attend to them, to read information (information acquisition) which the sender may be unaware of, trying to hide, or utilizing in a social way. You can also actively send messages "the social smile," " the appeasement grin," "the sneer of distain" which are easily read by others (information donation). The second is a more complex and constructed event, and is a major aspect of developing and maintaining social relations (in both humans and primates). Young primates learn the appropriate use of facial gestures from adults, just as young children learn to use non verbal as well as verbal communication skills to mold their worlds. Humans have a major advantage over all other primates in the complexity of their verbal system which allows teaching to occur declaratively, reflexively, and admonishingly. Humans can teach actions, ideas, and social relationships verbally, but do not do so all the time. In some cultures more than others, non verbal teaching is a very important part of the information transmitting repertoire. I realize that a number of people regard the results (output) of human systems to be so far in advance of nonhuman ones as to make them appear distinctive and unique. But if the development of communication skills and the transmission of information is regarded from the perspective of evolutionary analysis, the regularity of pattern allows human achievements to fall into place at one end of the range.

Each of these two books have some very controversial ideas and strongly

support one side of a current widely debated argument. The idea that emotion, as reflected in facial displays - the face is the window of the soul - has been a paradigm of research for quite some time. The uniqueness of human communicative abilities has also been a widely held position. These books are very useful in presenting alternatives to these long held positions because it is by questioning "received wisdom" that new perspectives can arise which may lead to new synthesis of data and ideas.

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