Jane Goodall, In the Shadow of Man, 1971.

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IN THE SHADOW OF MAN

THE AMAZING SUCCESS of man as a species is the result of the evolutionary development of his brain which has led, among other things, to tool-using, toolmaking, the ability to solve problems by logical reasoning, thoughtful cooperation, and language. One of the most striking ways in which the chimpanzee biologically resembles man lies in the structure of his brain. The chimpanzee, with his capacity for primitive reasoning, exhibits a type of intelligence more like that of man than does any other mammal living today. The brain of the modern chimpanzee is probably not too dissimilar to the brain that so many millions of years ago directed the behavior of the first ape men.

Previous to that far off day when I first watched David Graybeard and Goliath modifying grass stems in order to use them to fish for termites, the fact that prehistoric man made tools was considered to be one of the major criteria distinguishing him from other creatures. As I pointed out earlier, the chimpanzee does not fashion his probes to "a regular and set pattern"—but then, prehistoric man, before his development of stone tools, undoubtedly poked around with sticks and straws, at which stage it seems unlikely that he made tools to a set pattern, either.

It is because of the close association in most people's minds of tools with man that special attention has always been focused upon any animal able to use an object as a tool; but it is important

to realize that this ability, on its own, does not necessarily indicate any special intelligence in the creature concerned. The fact that the Galapagos woodpecker finch uses a cactus spine or twig to probe insects from crevices in the bark is indeed a fascinating phenomenon, but it does not make the bird more intelligent than a genuine woodpecker that uses its long beak and tongue for the same purpose.

The point at which tool-using and toolmaking, as such, acquire evolutionary significance is surely when an animal can adapt its ability to manipulate objects to a wide variety of purposes, and when it can use an object spontaneously to solve a brand-new problem that without the use of a tool would prove insoluble.

At the Gombe Stream alone we have seen chimpanzees use objects for many different purposes. They use stems and sticks to capture and eat insects and, if the material picked is not suitable, then it is modified. They use leaves to sop up water they cannot reach with their lips—and first they chew on the leaves and thus increase their absorbency. One individual used a similar sponge to clean out the last smears of brain from the inside of a baboon skull. We have seen them use handfuls of leaves to wipe dirt from their bodies or to dab at wounds. They sometimes use sticks as levers to enlarge underground bees' nests.

In captivity chimpanzees often use objects as tools quite spontaneously. One group that was studied intensively by Wolfgang Köhler used sticks to try to pry open box lids and to dig in the ground for roots. They wiped themselves with leaves or straw, scratched themselves with stones, and poked straws into columns of ants in order to eat the insects rather as the Gombe Stream chimpanzees fish for termites. They often used sticks and stones as weapons during aggressive encounters. Sometimes they used bread to lure chickens close to their enclosure, whereupon they would suddenly prod the birds with sharp sticks, apparently for amusement. Extensive tests have been carried out in laboratory

settings in order to find out more about the tool*making* ability of the chimpanzee. Results show that he can pile up to five boxes one on top of the other in order to climb to a hanging food lure, that he can fit up to three tubes together to reach food placed outside the bars of his cage, and that he can uncoil part of a length of wire for the same purpose. So far, however, no chimpanzee has succeeded in using one tool to make another. Even with tuition one chimpanzee, the subject of exhaustive tests, was not able to use a stone hand ax to break a piece of wood into splinters suitable for obtaining food from a narrow pipe. She could do this when the material was suitable for her to break off pieces with her teeth but, although she was shown how to use the hand ax on tougher wood many times, she never even attempted to make use of it when trying to solve the problem. However, many other chimpanzees must be tested before we say that the chimpanzee as a species is unable to perform this act. Some humans are mathematicians—others are not.

When the performance of the chimpanzee in the field is compared with his actual abilities in test situations, it would seem that, in time, he might develop a more sophisticated tool-culture. After all, primitive man continued to use his early stone tools for thousands of years, virtually without change. Then we find a more refined type of stone tool-culture suddenly appearing widespread across the continents. Possibly a stone-age genius invented the new culture and his fellows, who undoubtedly learned from and imitated each other, copied the new technique.

If the chimpanzee is allowed to continue living he, too, might suddenly produce a race of chimp superbrains and evolve an entirely new tool-culture. For it seems almost certain that, although the ability to manipulate objects is innate in a chimpanzee, the actual tool-using patterns practiced by the Gombe Stream chimpanzees are learned by the infants from their elders. We saw one very good example of this. It happened when a female had diarrhea: she picked a large handful of leaves and wiped her messy

bottom. Her two-year-old infant watched her closely and then twice picked leaves and wiped his own clean bottom.

To Hugo and me, and assuredly to many scientists interested in human behavior and evolution, one significant aspect of chimpanzee behavior lies in the close similarity of many of their communicatory gestures and postures to those of man himself. Not only are the actual positions and movements similar to our own but also the contexts in which they often occur.

When a chimpanzee is suddenly frightened he frequently reaches to touch or embrace a chimpanzee nearby, rather as a girl watching a horror film may seize her companion's hand. Both chimpanzees and humans seem reassured in stressful situations by physical contact with another individual. Once David Graybeard caught sight of his reflection in a mirror. Terrified, he seized Fifi, then only three years old. Even such contact with a very small chimp appeared to reassure him; gradually he relaxed and the grin of fear left his face. Humans may sometimes feel reassured by holding or stroking a dog or some other pet in moments of emotional crisis.

This comfort, which chimpanzees and humans alike appear to derive from physical contact with another, probably originates during the years of infancy, when for so long the touch of the mother, or the contact with her body, serves to calm the frights and soothe the anxieties of both ape and human infants. So, when the child grows older and his mother is not always at hand, he seeks the next best thing—close physical contact with another individual. If his mother is around, however, he may deliberately pick her out as his comforter. Once when Figan was about eight years old he was threatened by Mike. He screamed loudly and hurried past six or seven other chimps nearby until he reached Flo; then he held his hand toward her and she held it with hers. Calmed, Figan stopped screaming almost at once. Young human beings, too, continue to unburden their hearts to their mothers long after the days of childhood have passed—

provided, of course, that an affectionate relationship exists between them.

There are some chimps who, far more than others, constantly seem to try to ingratiate themselves with their superiors. Melissa, for one, particularly when she was young, used to hurry toward and lay her hand on the back or head of an adult male almost every time one passed anywhere near her. If he turned toward her, she often drew her lips back into a submissive grin as well. Presumably Melissa, like the other chimps who constantly attempt to ingratiate themselves in this way, is simply ill at ease in the presence of a social superior, so that she constantly seeks reassurance through physical contact. If the dominant individual touches her in return, so much the better.

There are many human Melissas: the sort of people who when trying to be extra friendly reach out to touch the person concerned and smile very frequently and attentively. Usually they are, for some reason or other, people who are unsure of themselves and slightly ill at ease in social contexts. And what about smiling? There is much controversy as to how the human smile has evolved. It seems fairly certain, though, that we have two rather different kinds of smile, even if a long time ago they derived from the same facial gesture. We smile when we are amused and we smile when we are slightly nervous, on edge, apprehensive. Some people, when they are nervous at an interview, smile in this way at almost everything that is said to them. And this is the sort of smile that can probably be closely correlated with the grin of the submissive or frightened chimpanzee.

When chimpanzees are overjoyed by the sight of a large pile of bananas they pat and kiss and embrace one another rather as two Frenchmen may embrace when they hear good news, or as a child may leap to hug his mother when told of a special treat. We all know those feelings of intense excitement or happiness which cause people to shout and leap around, or to burst into tears. It is not surprising that chimpanzees, if they feel anything

akin to this, should seek to calm themselves by embracing their companions.

I have already described how a chimpanzee, after being threatened or attacked by a superior, may follow the aggressor, screaming and crouching to the ground or holding out his hand. He is, in fact, begging a reassuring touch from the other. Sometimes he will not relax until he has been touched or patted, kissed or embraced. Figan several times flew into a tantrum when such contact was withheld, hurling himself about on the ground, his screams cramping in his throat until the aggressor finally calmed him with a touch. I have seen a human child behaving in the same sort of way, following his mother around the house after she has told him off, crying, holding on to her skirt, until finally she picked him up and kissed and cuddled him in forgiveness. A kiss or embrace or some other gesture of endearment is an almost inevitable outcome once a matrimonial dispute has been resolved, and in many cultures the clasping of hands occurs to denote renewal of friendship and mutual forgiveness after a quarrel.

When one human begs forgiveness from or gives forgiveness to another there are, however, moral issues involved; it is when we consider these that we get into difficulties in trying to draw parallels between chimpanzee and human behavior. In chimpanzee society the principle involved when a subordinate seeks reassurance from a superior, or when a high-ranking individual calms another, is in no way concerned with the right or wrong of the aggressive act. A female who is attacked for no reason other than that she happens to be standing too close to a charging male is quite as likely to approach the male and beg a reassuring touch as is the female who is bowled over by a male while she attempts to take a fruit from his pile of bananas.

Again, while we may make a direct comparison between the effect on anxious chimpanzee or human of a touch or embrace of reassurance, the issue becomes complicated if we probe into the motivation that directs the gesture of the ape or the human

who is doing the reassuring. Human beings are capable of acting from purely unselfish motives; we can be genuinely sorry for someone and try to share in his troubles in an endeavor to offer comfort and solace. Such purely altruistic feelings are probably rare in chimpanzee society, although a mother, I am sure, is genuinely concerned if a member of her family is suffering, and siblings, on occasion, clearly sympathize with one another also.

Moreover, what passes for genuine concern among humans may not always spring from purely altruistic motives. We feel unease in the presence of an abject, weeping person. We may feel compelled to try to calm him, not because we are sorry for him in the altruistic sense, but because his behavior disturbs our own feeling of well-being. Perhaps the sight—and especially the sound—of a crouching, screaming subordinate similarly makes a chimpanzee uneasy; the most efficient way of changing the situation is for him to calm the other with a touch.

There is one more aspect to consider in relation to the whole concept of reassurance behavior in chimpanzees, and that is the possible role played by social grooming in the evolution of the behavior. For the chimpanzee—and for many other animals too—social grooming is the most peaceful, most relaxing, most friendly form of physical contact. Infant chimpanzees are never starved for physical contact since they spend much time close to their mothers. Then, as they grow older, they spend more time away from their mothers and also more time playing with other youngsters; and play typically involves a good deal of physical contact. As the youngster matures he gradually plays less frequently; he does, however, spend increasingly more time socially grooming, either with his mother and siblings or, as he gets older, with other adults. Sometimes a grooming session between mature individuals may last for two hours. The obvious need for social grooming was well demonstrated when old Mr. McGregor, with his paralyzed legs, dragged himself those sixty long yards to try to join a group of grooming males.

When a chimpanzee solicits grooming he usually approaches the selected partner and stands squarely in front of him, either facing him with slightly bowed head or facing away and thus presenting his rump. Is it possible, then, that submissive presenting of the rump, and submissive bowing and crouching, may have derived from the postures used to solicit grooming? That in the mists of the past the subordinate approached his superior, after he had been threatened, to beg for the reassuring, calming touch of grooming fingers? If so, then the response of the chimpanzee thus approached, the touch or the pat, may equally have been derived from the grooming pattern. Indeed, on some occasions a few brief grooming movements do occur when a dominant individual reaches out in response to the submissive posture of a subordinate. It is quite reasonable to suppose that such a response may have become ritualized over the centuries so that today the chimpanzee usually gives a mere token touch or pat in place of grooming his submissive companion.

When two chimpanzees greet each other after a separation, their behavior often looks amazingly like that shown by two humans in the same context. Chimpanzees may bow or crouch to the ground, hold hands, kiss, embrace, touch, or pat each other on almost any part of the body, especially the head and face and genitals. A male may chuck a female or an infant under the chin. Humans, in many cultures, show one or more of these gestures. Even the touching or holding of another's genitals is a greeting in some societies; in fact, it is described in the Bible, only it has been translated as the placing of the hand under the companion's thigh.

In human societies much greeting behavior has become ritualized. A man who smiles when greeting a friend, or who inclines his head when passing an acquaintance in the street, is not necessarily acknowledging that the other has a superior social status. Yet the nod undoubtedly derives from submissive bowing or prostration and the smile from a nervous grin. Often, though,

human greetings still do serve to clarify the relative social status of the individuals concerned, particularly on formal occasions.

A greeting between two chimpanzees nearly always serves such a purpose—it reestablishes the dominance status of the one relative to the other. When nervous Olly greets Mike she may hold out her hand toward him, or bow to the ground, crouching submissively with downbent head. She is, in effect, acknowledging Mike's superior rank. Mike may touch or pat or hold her hand, or touch her head, in response to her submission. A greeting between two chimps is usually more demonstrative when the individuals concerned are close friends, particularly when they have been separated for days rather than hours. Goliath often used to fling his arms around David, and the two would press their lips to each other's faces or necks when they met; whereas a greeting between Goliath and Mr. Worzle seldom involved more than a casual touch even when the two had not seen each other for some time.

It is not only the submissive and reassuring gestures of chimpanzees that so closely resemble our own. Many of their games are like those played by human children. The tickling movements of a chimpanzee's fingers during play are probably identical with human tickling. Some of the chimpanzee's aggressive patterns are not dissimilar to some of ours. Like a human, an angry chimpanzee may stare fixedly at an opponent, raise his forearm rapidly, jerk back his head a little, run toward the adversary upright and waving his arms, throw stones, wield sticks, hit, kick, bite, scratch, and pull the hair of a victim.

In fact, if we survey the whole range of the postural and gestural communication signals of chimpanzees on the one hand and humans on the other, we find striking similarities in many instances. It would appear, then, that man and chimp either have evolved gestures and postures along a most remarkable parallel or that we share with the chimpanzees an ancestor in the dim and very distant past; an ancestor, moreover, who communicated

with his kind by means of kissing and embracing, touching and patting and holding hands.

One of the major differences between man and his closest living relative is, of course, that the chimpanzee has not developed the power of speech. Even the most intensive efforts to teach young chimps to talk have met with virtually no success. Verbal language represents a truly gigantic stride forward in man's evolution.

Chimpanzees do have a wide range of calls, and these certainly serve to convey some types of information. When a chimp finds good food he utters loud barks; other chimps in the vicinity instantly become aware of the food source and hurry to join in. An attacked chimpanzee screams and this may alert his mother or a friend, either of whom may hurry to his aid. A chimpanzee confronted with an alarming and potentially dangerous situation utters his spine-chilling *wraaaa*—again, other chimps may hurry to the spot to see what is happening. A male chimpanzee, about to enter a valley or charge toward a food source, utters his pant-hoots—and other individuals realize that another member of the group is arriving and can identify which one. To our human ears each chimpanzee is characterized more by his pant-hoots than by any other type of call. This is significant since the pant-hoot in particular is the call that serves to maintain contact between the scattered groups of the community. Yet the chimps themselves can certainly recognize individuals by other calls; for instance, a mother knows the scream of her offspring. Probably a chimpanzee can recognize the calls of most of his acquaintances.

While chimpanzee calls do serve to convey basic information about some situations and individuals, they cannot for the most part be compared to a spoken language. Man by means of words can communicate abstract ideas; he can benefit from the experiences of others without having to be present at the time; he can make intelligent cooperative plans. All the same, when humans come to an exchange of emotional feelings, most people

fall back on the old chimpanzee-type of gestural communication—the cheering pat, the embrace of exuberance, the clasp of hands. And when on these occasions we also use words, we often use them in rather the same way as a chimpanzee utters his calls—simply to convey the emotion we feel at that moment. "I love you. I love you," repeats the lover again and again as he strives to convey his overwhelming passion to his beloved—not by words but by his embraces and caresses. When we are surprised we utter inanities such as "Golly!" or "Gosh!" or "Gee whiz!" When we are angry we may express ourselves with swear words and other more or less meaningless phrases. This usage of words on the emotional level is as different from oratory, from literature, from intelligent conversation, as are the grunts and hoots of chimpanzees.

Recently it has been proved that the chimpanzee is capable of communicating with people in quite a sophisticated manner. There are two scientists in America, Allen and Beatrice (Trixie) Gardner, who have trained a young chimpanzee in the use of the approved sign language of the deaf. The Gardners felt that, since gesture and posture formed such a significant aspect of *chimpanzee* communication patterns, such a sign language might be more appropriate than trying to teach vocal words.

Washoe was brought up from infancy constantly surrounded by human companions. These people from the start communicated in sign language with Washoe and also with each other when in the chimp's presence. The only sounds they made were those approximating chimpanzee calls such as laughter, exclamations, and imitations of Washoe's own sounds.

Their experiment has been amazingly successful. At five years of age Washoe can understand some three hundred and fifty different symbols, many of which signify clusters of words rather than just a single word, and she can also use about one hundred and fifty of them correctly. The Gardners have been criticized for allowing Washoe to use "sloppy" signing. As a matter of

fact, some signs were taught to Washoe in a slightly different form when this corresponded quite closely to one of her own gestures. Other signs Washoe changed of her own accord when she was small—and, interestingly, it came about that many of these adaptations were exactly the same as those used by small human children. In other words, they represent the "baby talk" of the deaf and dumb child. Many of these Washoe corrected as she grew older.

I have not seen Washoe, but I have seen some film demonstrating her level of performance and, strangely enough, I was most impressed by an error she made. She was required to name, one after the other, a series of objects as they were withdrawn from a sack. She signed off the correct names very fast—but even so, it could be argued that an intelligent dog would ultimately learn to associate the sight of a bowl with a correct response of one scratch on the floor, a shoe with two scratches, and so on. And then a brush was shown to Washoe, and she made the sign for a comb. That to me was very significant. It is the sort of mistake a small child might make, calling a shoe a slipper or a plate a saucer—but never calling a shoe a plate.

Perhaps one of the Gardners' most fascinating observations concerns the occasion when for the first time Washoe was asked (in sign language) "Who is that?" as she was looking into a mirror. Washoe, who was very familiar with mirrors by that time, signaled back, "Me, Washoe."

This is, in a way, a scientific proof of a fact we have long known—that, in a somewhat hazy way, perhaps, the chimpanzee has a primitive awareness of Self. Undoubtedly there are people who would prefer not to believe this, since even more firmly rooted than the old idea that man is the only toolmaking being is the concept that man alone in the animal kingdom is Self-conscious. Yet, this should not be disturbing. It has come to me, quite recently, that it is only through a real understanding of the ways in which chimpanzees and men show similarities in

behavior that we can reflect with meaning on the ways in which men and chimpanzees *differ*. And only then can we really begin to appreciate, in a biological and spiritual manner, the full extent of man's uniqueness.

Man is aware of himself in a very different way from the dawning awareness of the chimpanzee. He is not just conscious that the body he sees in a mirror is "I," that his hair and his toes belong to *him*, that if a certain event occurs *he* will be afraid, or pleased or sad. Man's awareness of Self supersedes the primitive awareness of a fleshly body. Man demands an explanation of the mystery of his being and the wonder of the world around him and the cosmos above him. So man, for centuries, has worshiped a God, has dedicated himself to science, has tried to penetrate the mystery in the guise of the mystic. Man has an almost infinite capacity for preoccupation with things other than Self: he can sacrifice himself to an ideal, immerse himself in the joys or sorrows of another; love, deeply and unselfishly; create and appreciate beauty in many forms. It should not be surprising that a chimpanzee can recognize himself in a mirror. But what if a chimpanzee wept tears when he heard Bach thundering from a cathedral organ?

In his long quest for truth the scientist has never been able to provide a platform for man's ancient belief in God and the spirit. Yet, who in the silence of the night or alone in the sunrise has not experienced—just once perhaps—a flash of knowledge "that passeth all understanding"? And for those of us who believe in the immortality of the spirit, how much richer life must be.

Yes, man definitely overshadows the chimpanzee. The chimpanzee is, nevertheless, a creature of immense significance to the understanding of man. Just as he is overshadowed by us, so the chimpanzee overshadows all other animals. He has the ability to solve quite complex problems, he can use and make tools for a

variety of purposes, his social structure and methods of communication with his fellows are elaborate, and he shows the beginnings of Self-awareness. Who knows what the chimpanzee will be like forty million years hence? It should be of concern to us all that we permit him to live, that we at least give him the chance to evolve.