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BIPEDAL ARMED FIGHTING IN CHIMPANZEES

by

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At the request of the Organizer, I shall deal not only with the subject announced in the title of this lecture, but also with other behavioral adaptations, and particularly with the humanoid features in the behavior of chimpanzees in the wild. Therefore please consider the abstract in the Proceedings as an appendix providing additional data to this lecture.

The ecological core problem of ape behavior research may be formulated as follows: Why have the great apes, in the course of evolution, not become more human than they are? It makes certainly sense to raise this question, at first because the great apes in general and chimpanzees in particular show in captivity many potentialities for humanoid behavior which, however, apparently remain dormant in their wild life, and secondly because the Australopithecine fossil finds demonstrate that, in the evolutionary past, creatures with a brain volume hardly superior to our contemporary great apes, once have been able to form a humanoid type of culture.

When dealing with the question of why the great apes and particularly chimpanzees have not become more human in their wild life, we are primarily concerned with a problem of behavioral adaptation to environment. Therefore, in this speech, I intend to deal with four aspects of chimpanzee ecology and behavior, namely:

(1) Natural habitat,
(2) Predatory behavior,
(3) Bipedal locomotion,
(4) The use of fighting tools against natural ennemies.

Now point 1, i.e. the natural habitat. Most people tend to think that chimpanzees are essentially arboreal inhabitants of the African great rain forest, and that they move by brachiating from tree crown to tree crown, while picking fruit. This picture, however, is quite misleading. Actually, chimpanzee habitats vary: from extremely poor and dry tree-savanna landscapes, via moderately poor riverine forests and inaccessible swamps, via the rich equatorial rain forests, up to foggy and ice-cold maountains, even at altitudes of 8000 feet or 2400 meters. Few animals show such a wide variety of habitat, at any rate no other primate except man. Furthermore, with regard to arboreal locomotion, the way of growth of tropical forest trees makes climbing from one fruit-bearing tree to another one usually either impossible or impractical. Consequently, as a rule chimpanzees walk on the ground from one tree to another one, and their social life, play activities, fleeing routes etc. are also almost exclusively on the ground.

The biological function of their long arms seems mainly, instead of to brachiate as anatomists and zoo visitors usually assume, to enable them to climb, from the ground, thicker tree trunks than those that can be climbed by their food competitors, i.e. notably monkeys and some African peoples. Ultimately, therefore, we may characterize the chimpanzee ecologically as an extremely eurytopic and predominantly ground-living animal species which, in the course of evolution, has become particularly well-adapted to climb isolated tall trees in widely different types of habitat. However, outside forest and thicket vegetations, chimpanzees seem to be found only in areas where man either does not occur, or does not hunt them, for religious reasons. If one wants to see chimpanzees in Africa, one should go to areas where they are considered to be sacred. Apparently it is man who has expelled them from open habitats almost everywhere.

Let us now consider point 2, i.e. predatory behavior in chimpanzees.

In the past, scientific hunters seem never to have found vertebrate remains in chimpanzee stomachs, except one case in which the bones of bird nestlings were found. Furthermore, when I studied rain forest inhabiting chimpanzees in the Congo, none of them ate the potential prey which I had placed on their path, and only one individual regularly ate eggs. Thus it seems that forest-dwelling chimpanzees are definitely non-carnivorous. In captivity, however, many chimpanzees often show incipient predatory behavior towards mice, rats, birds, lizards, etc. and some individuals develop complete predatory behavior. Furthermore, Miss Goodall recently observed that savanna-inhabiting chimpanzees in Tanganyika regularly predate on young antelope and hare. Apparently, therefore, the potentiality to develop full predatory behavior is basically present in chimpanzees, but develops in the wild only under special ecological conditions, notably in savanna regions where strong climatic fluctuations and periods of food scarcity occur. Thus, in this respect again, chimpanzee behavior in the wild appears to be more polymorphic -- and at the same time more anthropomorphic -- than we previously have imagined; and this again supports the tentative conclusion that they should be considered as a eurytopic species, biologically adapted equally to both forest and savanna habitats.

Now point 3, i.e. bipedal locomotion.

Standing and walking on two legs in a more or less erect posture can be induced in wild chimpanzees by 4 types of situation. At first, when they enter or pass through an open site, they often stand or walk for a while in an almost fully erect posture, in order thus better to be able to look over the vegetation and to inspect the place. To give you an example, I will show a few film shots.

(Film of upright inspection posture.)

That was the upright inspection posture. Such a posture makes little sense in a forest habitat, because there chimpanzees rather tend to climb a tree if they want to have a better look. Therefore this posture should be considered primarily as a behavioral adaptation to savanna habitats. However, it is shown also by forest-dwelling chimpanzees namely when they enter man-made plantations. Thus potentially they are equally adapted to savanna conditions in this respect.

A second reason for which chimpanzees often walk or run bipedally, is food transportation to a place where they feel safe. Two examples will be shown on the film. You will see a chimpanzee carrying eight hen eggs, at first bipedally, one egg in the mouth, three in one hand, and four in the other hand, thereafter tripedally, two or three eggs in the mouth, one or two in one hand and four in the other hand.

Further you will see a chimpanzee carrying a heavy load of bananas.

(Film of bipedal food transportation.)

The survival value of bipedal food transportation is that it enables the ape quickly to collect a copious meal at an open site and subsequently to consume it at his ease at a safe place. (It is the same problem which the hoofed mammals have solved by ruminating.) Chimpanzees may also walk bipedally in order to be able to eat while on the move, which is a very efficient way to do two things at the same time. All such bipedal food transportation would make no sense in a forest habitat, (1) because one would soon bump his head when attempting to do so in a chimpanzee forest tunnel path, (2) because in the forest there is no reason to carry food to a place offering a safe cover, and (3) because in tall trees it is more efficient to consume the fruit at the spot in the tree tops. Therefore, bipedal food transportation should be interpreted as a behavioral adaptation to savanna habitats. However, this behavior again is potentially present also in forest-inhabiting chimpanzees and it emerges immediately when man creates papaja plantations, i.e. a savanna-type of vegetation amidst of a forest habitat.

A third reason for which chimpanzees may walk on 2 legs is that they just like to do so for a while, when entering an open site after having walked for a long time on all fours in their low forest tunnels. Such behavior, together with their fondness to look at wide panoramas, gives the human observer the subjective impression as if these apes feel so to speak some kind of evolutionary nostalgia towards the open landscapes from which they have been expelled almost everywhere in Africa.

A fourth reason for which chimpanzees may walk or run bipedally, is that this posture enables them more effectively to use sticks and branches as weapons to intimidate and fight off beasts of prey. This brings me at the same time to point (4) of my speech.

Unfortunately, the data from the wild concerning this behavior are still very incomplete, and therefore I will start to consider some data from captivity.

According to zoo observations and experiments, primitive ways of armed fighting are, in chimpanzees a semi-instinctive defense response against large Felines. Such armed fighting consists of: the throwing of any object at hand, the brandishing, throwing and clubbing with big sticks and similar uses of fighting tools. As an example, let me show you an experiment conducted at the Rotterdam Zoo in which a captive-born half-grown male chimpanzee who had never seen a large cat before and who had hardly ever performed any throwing activity before was suddenly confronted with a half-grown and somewhat aggressive tiger. You will see that the weapon use as such was spontaneous, i.e. instinctive, but the aiming had still to be learned. May I have Part III of the film please?--(16 frames per sec!)

(Film of the experiment with Primo and the tiger.)

Zoo data on adult chimpanzees show that well-aimed throwing and proficient ways of clubbing develop, in chimpanzees, only if these apes are kept in a very large enclosure, i.e. in a savanna-like type of environment. Newly-captured forest-inhabiting chimpanzees seem to be unable accurately to aim and throw or proficiently to use sticks as clubs, as has been shown already by W. Köhler. Apparently, therefore, a forest-type of habitat does not provide sufficient space to train and exercise these abilities.

Another aspect is that, according to zoo observations, all such ways of armed fighting, when performed by adults with full fierceness and fully skilled, seem always performed in the bipedal way.

As an example, I will now show you an experiment which I was allowed to conduct at the Institut Pasteur in the Guinean Republic. The film demonstrates what happened when a group consisting of one male, three mothers, and five juveniles living in a large open enclosure was confronted with a leopard at the top of the wall around their compound. At first you will see that the adults ran up immediately partly running bipedally in their intimidation display. Subsequently they grabbed the sticks I had laid ready, in lengths varying from one to four or five feet. You will see that small sticks were thrown away; intermediate sticks were used to brandish and threaten towards the leopard, and finally, when the adult male had found the biggest club available, he made with it a furious charge at the leopard, holding the stick in the human way in his right hand, and running bipedally at full speed. In the film this event proceeds very quickly, and therefore I will first demonstrate it myself. I have got a slide of the charging attitude: Now the slide please.-- Is not it human?

In the film you will further see: that a mother grabs the big stick with which her oldest child is playing, hints the child by means of a hand gesture to stay behind, walks down bipedally the staircase towards the ditch and the wall, finds herself, however, unable to reach or strike at the leopard, then attempts to throw the stick towards the animal, and then hastily runs back to safety on all fours.

(Film of the leopard experiment at the Institut Pasteur in Guinea)

Now I have not yet told you the most important point of all. The adults in this chimpanzee group had been captured in Western Guinea in a savanna area with riverine forests and at a nearly adult age. We may be pretty certain, therefore, that these chimpanzees must have known leopards as predators from experience in the wild. Apparently we have to assume that savanna-inhabiting chimpanzees fight leopards with clubs, and do so bipedally, in a way that looks to be homologous with the human way to use clubs as weapons.

Forest-inhabiting chimpanzees, on the other hand, perform such behavior only in a rather incipient form and in a very much less proficient way. A few weeks ago, when I was still observing chimps in the Congo, I conducted three trials in which a group of wild chimpanzee mothers were confronted with a stuffed leopard with a wagging tail and holding a chimpanzee doll in his mouth. They did charge fiercely at the leopard in the bipedal way and they did use branches and small tree trunks as clubs and missiles, but their aiming accuracy in clubbing and throwing was very poor, and none of them achieved a hit. On the whole, the level of performance was much lower than what was shown in Guinea. Their most effective way of using weapons was to use a small tree as a kind of whip, in this way....(I am sorry I cannot show you the film of this experiment because it has not yet been developed.)

Now I must admit that a definitive conclusion can be drawn only when such experiments will have been conducted in the wild with both sexes, and in all kinds of habitats. Unfortunately, I did not manage to conduct the same experiment with the males at my observation site in the Congo. For the time being, we may tentatively conclude that the bipedal armed fighting technique in chimpanzees is a semi-instinctive defense response towards the large cats, but develops into its full effectiveness and proficiency in the wild only if these apes regularly come out into more or less open habitats.

Incidentally, this result may seem rather obvious. At first, in the forest, one can always climb a tree to flee for a leopard. Secondly, in the forest, when attempting to fight a beast of prey with a hand-borne weapon and in a bipedal posture, one would only bump his head, scratch his face, and entangle his club, while the enemy would be in an excellent position to jump at one's throat. In a savanna habitat, on the other hand, an erect posture allows the ape to swing and throw his weapons freely over the undergrowth.

However, the puzzling thing is that, at present at least, maybe about 95 or even 98% of all chimpanzees live in continuous forest habitats. Nevertheless, when kept in a zoo in a large open enclosure, all or nearly all of them at least in the male sex spontaneously develop the use of throwing and clubbing weapons, and do so in the bipedal way when performed with full fierceness. The question now is:

How could such a semi-instinctive behavior pattern ever have emerged and evolved in a species in which it makes no sense and would even be detrimental in 95 or 98% of its natural range? I would think the only plausible answer is to assume that this behavior pattern could have emerged originally only in ancestors that lived more regularly in open habitats than their descendants to date do; i.e. it could have emerged originally in ecologically more humanoid apes than our contemporary chimpanzees are. Apparently they withdrew into the forest when the early Hominids achieved the spear and could kill their food competitors in open sites from a safe distance. As I mentioned already, even to date some African peoples, particularly the Pygmies, compete with the great apes for fruit and honey. Some Pygmy peoples even designate "ape hunting" as "war" instead of as "hunting". They have formulated the basic ecological relation between man and ape more concisely than a scientist could ever hope to do.

This Mr. Chairman, brings me to the end of my speech.

I have considered four aspects of chimpanzee behavior, namely, natural habitat, predatory behavior, bipedal locomotion and armed fighting. With regard to all these four aspects the recent findings appear to lead to the conclusion that chimpanzees in their behavioral adaptations to a wide range of habitats are much more human than we previously have dreamt of in our philosophy. Furthermore: the question with which I started, i.e. Why have the great apes not become more human in their way of life? can now be answered by: Because the humanoid features in their behavior had hardly any survival value anymore when early Man expelled them from the wider niche their ancestors occupied.