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Human and Animal Aggression

This article is based on the paper given by Dr. Poole to the Victoria Institute in London on 19 May 1973. The author argues that what we call inhuman or bestial behaviour is not bestial at all but uniquely human, whilst man shares with animals much of what he thinks of as altruistic, such as comradeship, and even the laying down of one's life for a friend.

Evidence of the past half century has forced us, as a species, to have considerable misgivings about the long term survival of *Homo sapiens*. Many believe that man is in grave danger of extinction during the next two hundred years and few would deny that the survival of civilised man and his culture may soon be severely threatened. Two factors appear mainly to be responsible for this situation, firstly overpopulation and its attendant complications and secondly, our great potentiality for destructive aggression. These two factors, of course, are interrelated and both are associated with constant advances in man's technological knowledge over the past 100 years.

Acute awareness of man's aggressiveness has led to the increased interest of biologists in animal aggression. Whilst animals do not, so far as is known, wage genocidal wars, evolutionary principles justify us in examing related species to make comparisons between their aggressive behaviour and our own. Such an approach has, of course, proved highly successful so far as physiology is concerned and, for example, studies in the functioning of the rat's kidney have enabled us to discover how our own kidney

works and to make possible the survival of human beings from whom both kidneys have been surgically removed. Nevertheless, it would be naïve to suppose that comparisons between the behaviour of different species are as simple as physiological ones, for behaviour is plastic, highly adapted and adaptable in its relation to the animal's external environment. In addition, the human brain differs greatly from that of other species, although such differences are at a minimum in the phylogenetically ancient parts of the human brain where the control systems for aggression are located.

Clearly the study of animal aggression is justifiable purely as an academic pursuit but I believe that the human implications of such studies are of paramount importance. The roots of human aggression lie buried in our animal past and it seems reasonable to suppose that the basic architecture of human aggression resembles that of other species of mammal just as the basic architecture of, for example, the human skull resembles that of a monkey or a lemur. Knowledge of such structure can, I believe, lead to an insight into human aggression and, with understanding, a greater control over our irrational impulses.

There are many different views on aggression in man and animals and some of these are expressed in the collection of papers edited by Carthy and Ebling. [1] Before proceeding we need to have a working definition of aggression which is as unambiguous as possible and the definition which I shall adopt is that "aggression is any activity which is directed towards the discomfiture of another individual". This definition excludes the "playful aggression" of young mammals and also predatory behaviour, the latter type of behaviour being directed towards the acquisition of food.

Kinds of Aggression

Two kinds of aggression exist amongst animals, aggression between individuals of different species (*interspecific aggression*) and aggression between members of the same species (*intraspecific*

aggression). Of the two kinds, intraspecific aggression is the more relevant in the study of man so I shall consider interspecific aggression only briefly.

Interspecific aggression is exhibited in three main ways. (1) When a species defends itself against attack by a predator, as in the case of a moose attacking a wolf with its hooves. (2) In mobbing, as when prey animals such as small birds may make concerted attacks upon a predator such as an owl or buzzard. (3) When competition is involved; as when, for example, a pair of jackdaws attack a herring gull to rob it of its food.

The remainder of this paper will be concerned with intraspecific aggression and will be divided into two main sections. Firstly, I shall consider animal aggression and secondly, the bearing of animal aggression on some important examples of human aggression.

Animal Aggression

The majority of animals, when fighting, do not employ specialised weapons but use structures which also have other functions. Birds, for example, mostly use their beaks whilst mammals use their claws and teeth. Some animals, however, otherwise poorly endowed with natural weapons, have evolved special structures used solely in fighting: deer with their seasonally growing antlers are a good example. In spite of the formidable, indeed lethal weapons which many animals possess, fatalities are rare — in contrast to the situation among men. This is because fighting, in animals, has almost invariably become "ritualised" in such a way that no real harm comes to either of the combatants. In the elephant seal and the polecat, for example, the attacker grips the head or neck of its opponent with its elongated canine teeth. In both of these species deep wounds are inflicted by the canine teeth but because the skin of the neck is very thick, little real damage is done and the wounds heal rapidly. In the red deer which possesses weapons which could easily eviscerate an opponent, fighting is largely a pushing contest in which the two animals

interlock their antlers.

In many cases the beaten opponent takes to flight so that in nature the principle that " he who fights and runs away lives to fight another day " operates. In other cases the opponent submits to its rival by adopting a recognised " submissive posture ". This posture is extremely important in social animals such as baboons and rhesus monkeys for it allows two individuals to behave aggressively without one of them subsequently being driven out of the social group. The submissive posture therefore is most important in allowing armed rivals to live together in the same group in a state of peaceful coexistence. Submissive postures are characterised by the animal's concealing its weapons and by making itself as small and inoffensive as possible: the cringing submissive behaviour of the domesticated dog and human bowing and grovelling are well-known examples.

Another method by which injurious aggression is avoided is by threat which may deter a rival from counter attack. A common form of threat in mammals is the stare which occurs in monkeys, dogs and human beings; usually it is combined with an erect stance which gives the impression that the individual is poised for an attack. In addition the action of the hormone adrenalin causes erection of the hair which also serves to make the animal appear larger and more powerful than usual. This form of threat is the normal prelude to attack so that the rival associates such behaviour with being attacked.

To avoid injurious aggression it may be advantageous for an animal to convey some indication of its probable future behaviour to its rival — will this prove aggressive or otherwise? Communication systems fulfilling this role are found in many species and are termed 'displays'; those of a visual character being the best known. In general, displays appear to be derived from common behavioural traits which are ritualised to a more spectacular form. For example, the raised crest of the jay or sandwich tern appears to be derived from the usual erection of feathers which accompanies aggression. In some species of fish the motivational state of the animal is indicated by colour patterns

which vary according to its mood.

It is perhaps worth pointing out that in threat or submission there is no necessity to assume that an animal is aware that it is emitting the signal, nor that its opponent is aware of receiving it. For communication to be established all that is necessary is that it should be shown that the signal emitted by one individual predictably modifies the behaviour of its opponent. We are not generally conscious that a person who is hostile to us stands further away and that his pupils decrease in size, yet we respond to these signals. The German ethologist Paul Leyhausen drew attention to the threatening aspects of military dress such as built up shoulders, epaulettes and peaked caps which, combined with the military stance, are calculated to have an intimidating effect. Different species of animal use different signals yet the principles which govern the signalling systems are the same; the function of this form of communication is to avoid unnecessary conflict between unequally matched rivals or serious injury as a result of fighting. Animals which were seriously injured in intraspecific fighting would readily fall prey to other species. Furthermore, the seriously injured winner of one fight would soon fall victim to another rival of his own species should one chance to come along.

There are of course exceptions to the general rule that fighting is not injurious. For example, Schaller [2] has shown that male lions may mortally wound their rivals whilst Verheyen [3] showed that fatalities were common amongst hippopotami in the Upper Semliki river under overcrowded conditions. Such examples, however, are extremely uncommon.

It is axiomatic that in aggressive encounters between individuals two factors are of paramount importance; firstly that they should have the ability to recognise other animals of their own species as individuals and secondly that the rivals should retain some memory of their fight and its outcome. In fact, a very wide range of animals can distinguish familiar from alien individuals and, in general, aggression is greater towards aliens. Hostility towards aliens is also recognisable in man where, as in many other social species, members of a social group behave with hostility

towards non-members. The ease with which a non-member may join a social group varies greatly in different species; in wolves, for example, it is very difficult for a stranger to join the pack whilst at the other extreme olive baboons or vervet monkeys in a forest habitat are tolerant of entry by strange males into a group, provided that appropriate amicable and submissive behaviour is made by the newcomer. For human beings to join a group, rituals range from smiling and handshaking to complex initiation ceremonies. Such rituals share in common the fact that the new group member behaves in an unaggressive or even submissive manner.

Territory and Status

Aggressive behaviour in animals occurs most frequently in two contexts, namely territory and status. A territory is an area which is defended against identical species and the phenomenon of territoriality is found in the animal kingdom in a wide variety of animals ranging from invertebrates such as the fiddler crab to higher primates such as the gibbon and man himself. Birds such as the robin defend a territorial area and advertise their presence by song; thus the robin's song is equivalent to "trespassers will be prosecuted". Gibbons, it has been found, spend 6% of their time in border disputes with their neighbours. The possession of a territory gives the animal confidence within its territory and it has been found in the jewel fish that, for a territory occupier to be beaten in its territory, the opponent needed to be three times its size.

Territories vary greatly in size; in some cases, for example, in herring gull colonies, they include only the area in the immediate vicinity of the nest, whilst in other species, such as the gibbon, the territory represents both a breeding and foraging area. As Wynne Edwards[4] realised, territorial behaviour not only results in the spacing out of animals but it also affects population size. Animals of many species which fail to obtain and defend a territory also fail to breed, for example the red grouse; for such species territorial behaviour represents a population-regulating mechanism.

In species with large territories such as the gibbon, for example, the animal advertises its presence both by vocal means and by patrolling its boundary, thus actively seeking aggressive encounters with territorial neighbours. It must be stressed however that because the animal's confidence rapidly decreases once it has crossed a territorial boundary, border disputes mostly consist of threat, and physical assault is very uncommon.

A second context in which aggression occurs is that of status. Many social species have a peck order or rank order. This was first observed by Schelderup Ebbe in the domesticated fowl where he observed that hen A pecks B but B does not peck A. Hen B however pecks C whilst A pecks both B and C. Such one way aggressive interrelations form what is known as a "linear peck order" and similar peck orders, or rank orders, have been observed to occur in a wide variety of animals both in captivity and in the wild; for example, Lorenz [5] has described a peck order in jackdaws, and Hall and de Vore [6] described one in the savannah baboon. In the case of primates, rank order is frequently not a simple linear one but is complicated by the fact that different groups of individuals such as juveniles, females, adult males, etc. have characteristically different ranks. Rank order is further influenced by the stage of the female's reproductive cycle, receptive females and those with infants ranking higher than other females. In addition, the situation is complicated by alliances which may give a group of friends a higher rank than any one of them could occupy on its own. Rank in primates may even be associated with physical characteristics; the silver fur on the back of the older male chimpanzee is characteristic of the high rank which it occupies; the adult male baboon has a large mane, whilst in man, as in the chimpanzee, the hair of older individuals turns white. In these days of the cult of youth, of course, the possession of grey hair may come to be counter-productive in terms of status.

Individual aggressiveness varies greatly and each aggressive encounter, like most social interactions, is unique, so that a special relationship is formed between individuals in the social group. Status and territory result from aggressive behaviour so that it is probably more accurate to state that aggression leads to territory.

formation or status than to say that an animal has a hierarchical or territorial instinct and that, therefore, it defends its territory.

Some authors such as Ardrey[7] have claimed that man has a territorial imperative or territorial instinct but this is a drastic over-simplification of the true situation. Kalahari bushmen, for example, are not territorial and appear to lack any form of status system which parallels the biological one. However, it is apparent that human beings do have different status: for example, the mediæval ranks of Duke, Earl, Marquis, Baron, etc., represented a linear rank order and in mediæval society the individuals with the highest mortality (as in animals) were those lowest in the rank order (the landless peasants). Individuals with high rank also acquired large territories (the landed gentry) so that, in mediæval times, territory and status were interlinked. It seems clear that, in man, territorial or hierarchical behaviour is highly dependent upon the ecology of the nation or tribe. As with other higher primates, our social structure is dependent upon environmental conditions. In mobile groups such as baboons, high ranking individuals do not have a fixed territory but carry a 'portable territory' with them termed a social space — this is a space around an animal which other individuals avoid entering. Higher ranking individuals occupy a larger social space and thus the phenomenon occurs also in man where social space can readily be observed in, for example, the way in which people sit in the corners of a railway carriage or at the ends of a park bench as far away from one another as possible. The large executive office seems to emphasise the social space of the highest ranking member of an organisation. A parallel phenomenon was observed in macaques at the London Zoo by Chance[8] who found that the highest ranking male had a rock ledge to himself and that other individuals did not trespass on this area without making submissive gestures. Rank may be expressed in humans by clothing, posture, social space and behaviour as Argyle[9] has observed.

Comradeship

In spite of aggressive tendencies, animal societies generally

run smoothly and this is because certain unwritten rules operate which limit conflict. In most animal societies rape, murder and the attacking of juveniles are generally extremely rare and an individual transgressing in this way may be driven out of the group by a social superior. It is generally the accepted role of the individual to protect the young and to respect individuals both of much higher or much lower rank, challenges only being issued to individuals of similar status. In non-literate human societies similar rules apply and it is apparent that the ten commandments embody some of these unwritten laws which also operate in animal society. It is interesting that the sixth commandment reflects the animal situation in that hostility towards familiar individuals is controlled whilst that towards aliens is not; the commandment forbids murder but not the killing of individuals of alien groups.

Comradeship plays an important role in the aggression of some species. In savannah baboons, for example, both inter-group aggression which takes the form of threat towards alien groups and aggression directed against predators, involve a high degree of group loyalty. No individual alone can effectively threaten or injure a leopard but a concerted group threat or attack is effective. These baboons therefore, for their survival, rely on strong group loyalty which might be equated in human terms with identification with a group or 'patriotism'. Comradeship seems to be cemented by various behavioural activities such as grooming, mutual feeding or playing in animals; and smiling, handshaking, hugging and kissing in humans. Group cohesion is a necessary pre-requisite to any form of human warfare and it doubtless has its origins in our animal past. Some people in New Guinea only use the term 'man' for their own tribe; other humans are simply regarded as animals and hunted and treated like game. Such xenophobia appears to have its origins in our biological heritage.

Environment, Hormones and Frustration

So far the behaviour of animals and man has been discussed as though it were constant in form irrespective of the environmental situation. This is an oversimplification: some factors are well

known to influence animals' aggressive behaviour. A few of these factors can briefly be examined. That overcrowding leads to greater aggressiveness has been shown by making comparisons with zoo colonies of primates and their wild counterparts. Kummer [10] found that Hamadryas baboons showed 17½ times more aggression in a zoo colony as compared with wild baboons. Virgo and Waterhouse [11] observed that, by reducing the number of monkeys in an enclosure to half, the number of fights was reduced by 75%. Not only is the amount of aggression density — dependent in this way but the type of social structure is also determined. Reynolds and Luscombe [12] found that in most zoo colonies of chimpanzees the dominant male was a tyrant which attacked all other members of the group ; by contrast in the wild and under spacious conditions in captivity the leader was an amiable individual which showed a greater number of amicable social contacts than any of its fellows.

Ecology also may affect aggression ; olive baboons living in the rich forest areas are less aggressive than their counterparts living on the poorer savannahs. Carpenter [13] found that the amount of aggression shown by a group may also be greatly influenced by the ' character ' of the dominant male. He found that when Rhesus monkeys were released on the island of Cayo Santiago, one individual which he appropriately named ' Diablo ' led his band of monkeys into fights with other groups so that there was constant warfare and injurious fighting. The removal of this individual resulted in peace but as soon as he was reinstated in his group inter-group aggression commenced once more. The sex and maturity of an individual influence its aggressiveness. Mature males of most species are more aggressive than females and juveniles, and in many animals this is the result of a hormonal factor. Changes in hormonal balance may influence aggressiveness so that many animals are seasonally aggressive.

Many conflicting views are expressed on the causation of aggression in man and animals. Some psychologists have taken the view that aggression results from frustration and in certain situations this is undoubtedly true. From this it is argued that if an individual is not frustrated, he will not become aggressive,

a view which leads to the belief that aggression is purely pathological behaviour. This opinion however is at variance with the context of aggression as it is observed in nature. Many animals such as deer have developed special weapons for intraspecific fighting and it seems unlikely that the manifold anatomical adaptations related to aggressive behaviour in animals would have arisen simply because of frustration.

Is Aggression Learned?

A second view put forward by the American biologist J. P. Scott [14] is that aggression is learned. Male mice kept in groups of litter-mates do not show aggression but only do so if exposed to aliens. Scott interprets this fact by arguing that attacks by the aliens cause pain, which, in turn, makes the native mouse aggressive. Scott pinched the tails of unaggressive mice and found that they became aggressive when subjected to this treatment.

The situation, however, is not as simple as this, for it has been discovered (Poole and Morgan, in the press) that, if an alien male mouse is introduced into a colony of amicable male mice for 10 minutes per day, the amicable mice gradually become more aggressive. This aggression is not a response to aggression on the part of the alien, which is very nervous and submissive and avoids the colony members. It seems therefore that the stimulus of an alien mouse repeated at intervals induces male mice to become aggressive.

Aggressive Instinct

Lorenz [15] and Storr [16] take the view that aggression is an instinctive force which builds up and needs an outlet. This idea of a build up of 'psychic energy' is an attractive one as it seems to explain why, for example, a gibbon makes regular patrols of its territory 'looking for a fight'. Lorenz and Storr both argue that aggressive energy may be channelled into other types of behaviour, but if this is true it is difficult to know how aggressive

motivation can be assessed.

An attractive version of this hypothesis, put forward by Lorenz, is that aggressive drive might be channelled into play; the drawback so far as this hypothesis is concerned is, however, that animals always abandon play if a situation arises which elicits 'serious' behaviour. Even Francis Drake's finishing his game of bowls comes as a surprise to us and there seems little evidence to support the belief that the societies which are most successful in sport are also the least aggressive. Storr carries this idea of aggression being channelled into other types of behaviour so far that ultimately he equates the term 'aggression' with almost any form of spontaneous activity.

Such views appear to be dangerous for they seem to justify aggression and make it valuable if only it can be directed into the right channels; also they tend to lead to the attitude that it is harmful to frustrate aggression and better for an individual to "get it out of its system". The facility which existed for concentration camp commandants to do just this during the last war did not seem to reduce their aggressive drive noticeably nor make them better people. This issue cannot be treated adequately in a short paper but a fuller critique of these views has been made by Hinde [17] who argues cogently against energy models of motivation such as those of Lorenz and McDougal. [18]

Aggression is a normal part of the behavioural repertoire of many species of animal but it does not necessarily develop unless suitable stimuli are present in the environment. There seems to be no need to postulate either that aggression results from a build up of psychological energy or from environmental conditions in which the animal is either frustrated or subjected to painful stimuli. Aggression is behaviour which, given particular environmental circumstances, may be beneficial to the individual and promote its survival and reproductive success.

Uniqueness Factors in Human Aggression

It is clear that whatever the causation, we now have some knowledge as to the major biological factors which influence aggression ; factors such as confinement, over-crowding, unfamiliarity with the opponent, phase of the reproductive cycle and the presence of a particular opponent. Furthermore, it is apparent that unless animals are beaten in a fight, they do not find aggression aversive but may actively seek it.

This review of aggressive behaviour has shown that many of the factors which influence animal aggression also affect human aggression similarly so that there can be no doubt that a common substructure exists. I shall now consider those aspects of human aggression which appear to me to be unique to our own species.

Two forms of aggression are unique to man and these are organised warfare and cruelty to members of the same species. Animals, as we have seen, do not kill members of their own species and they have unwritten rules in their society which enable them to live at peace. Man, however, is the most aggressive creature in existence. Some authors such as Lorenz have suggested that man's aggression is related to his natural weapons, fisticuffs, rather than those lethal weapons which he has invented which range from simple flint axes to intercontinental ballistic missiles. Even with naturally occurring weapons such as sticks and stones, however, a man can kill and inflict cruelty on his fellow men.

Christian ideals represent the highest and all that is best in human behaviour and many Christians have lived lives in keeping with these precepts. Unfortunately organised Christianity has frequently been guilty of behaviour no better than its secular or religious rivals. It is easy to find examples of human aggressive behaviour from most cultures and the majority of religious traditions but because the Victoria Institute is committed to relating scientific knowledge to Christianity it would seem more honest to select examples of human aggression from Christian societies. This is not to say that Christian societies are worse than other societies although it might be argued that Christians have fewer

excuses because of the higher set of ideals before them. My main point is to make a plea for greater self knowledge because organized Christianity has not distinguished itself in its ability to avoid the pitfalls of warfare and cruelty into which mankind, in general, has fallen (the present situation in Northern Ireland clearly illustrates this point).

I shall give examples of war and cruelty perpetrated by Christian societies because they give specific illustrations of human aggressive behaviour.

In the thirteenth century when the Albigensian sect had established itself in the South of France, Pope Innocent III organised a crusade against its members, with a view to complete extermination. He proclaimed it a virtue to massacre as many heretics as possible and those who fought in this holy war were to receive complete indulgence for all their sins and the salvation of their souls if they fell fighting. It was counted an additional virtue to massacre as many heretics as they could and to maltreat and torture them, to which was added the right to make off with their goods, destroy their homes and take possession of their lands. It provided an ideal opportunity to make sure of saving one's soul whilst going on a crusade which involved little hardship or inconvenience and only 40 days enlistment period. The army consisted of 50,000 men but had a host of followers armed with scythes and clubs with which to murder women and children. Over 500 towns and castles were captured or destroyed and the Papal Legate who accompanied the army advised those who were inclined to spare the Catholics, " Slay them all, the Lord will recognise his own."

Taking an example from nearer our own time, when Spain was torn by civil war in 1936, two ideologies fought one another and both committed appalling atrocities. Hugh Thomas [19] describes how the Christian Nationalists shot their socialist opponents. In the presence of their wives and children they shaved the women's heads, and daubed their foreheads mockingly with some working class sign. Frequently wives who witnessed their husband's execution were then raped by their executioners. All that the Church insisted

upon was that those killed should have opportunity for confession. The Venerable Brother at Majorca stated with satisfaction that "only 10% of these dear children refused the sacraments before being dispatched by our good officers".

One particularly zealous priest at Zafra caused four militiamen and a wounded girl to dig their own graves and then had them buried alive in them. It is only fair to point out that a few churchmen protested but at the risk of their livings and a measure of persecution.

These examples are from the Roman Catholic tradition but Protestants have also behaved in a similar manner. In the 17th century the Anglican Church not only persecuted Puritans and Quakers but also killed Roman Catholic priests by hanging them. In 18th century Northern Ireland, Presbyterian gangs raided houses and terrorised the Roman Catholic population. Nearer to the present day both the Boer War and the 1914 – 1918 war waged between Christian states were sanctioned by the Anglican Church in Britain.

Milgram's Experiments

The experiments of S. Milgram [20] showed that even in peace time America, ordinary people can, under authority, inflict cruelty upon their fellow men — in Milgram's experiment his subjects were asked to assist in a "learning experiment" to investigate the effect of punishment on learning. The subjects were instructed to punish the so-called 'learners' (who were actually in league with the experimenter) when they made mistakes; punishment consisted of administering electric shocks of varied intensity (30 – 450 volts). The apparatus did not actually deliver shocks to the "learners", but this was not known by the subjects, and the learners had been instructed to behave as if they really had received the shock. Milgram found that his subjects would administer supposedly lethal shocks to the 'learners' in spite of their protests and entreaties. He concludes, "with numbing regularity we saw good people submit to the demands of authority

and commit actions that were without feeling and cruel . . . When as in this study an anonymous experimenter could successfully order adults to force a 50 year old man into submission and administer painful electric shocks to him in spite of his protests, then we can only be apprehensive about what a government — with much more authority — could order its subjects to do".

Milgram's experiments show that ordinary men will commit atrocities in the name of scientific investigation, thus demonstrating the truth of Derek Freeman's [21] remark that "human aggression is never more terrifying than when at the service of the dogmatic and delusory ideologies characteristic of *Homo sapiens*", and the comment by Durbin and Bowlby [22] that "men will die like flies for theories and exterminate one another with every instrument of destruction for abstractions".

Explanation — ?

I hope that I have now made it clear that what we term bestial or inhuman behaviour is in fact purely and characteristically human, whilst much of what we think of as altruistic, such as comradeship and laying down one's life for a friend, we share with animals. Thus we cannot blame our unparalleled aggressiveness on our animal ancestry; it forms a particularly human attribute. It is tempting to speculate whether any explanation of our present state can be suggested. My own hypothesis, based upon what is known of the recent evolutionary history of civilised man, runs along the following lines.

Homo sapiens evolved from a group of social primates from which we inherited a strong sense of group loyalty together with a feeling of hostility towards strangers. The invention of weapons capable of killing prey made it easy to kill other men, but at the hunter-gatherer level of society there was little or no incentive to kill other people. Once, however, pastoral or agricultural ways of life had developed, neighbouring tribes had possessions in the form of domesticated stock or grain which were objects of value

and it therefore became worthwhile at this stage in our evolution to kill off members of a neighbouring tribe in order to steal their lands and possessions. Plato and Rousseau both suggested that it was the spoils of war which made it profitable.

This view can readily find support by reference to biblical sources; the Lord said to Joshua, "see I have given into thy hand the land of Ai and her King . . . . . thou shalt do unto Ai and her King what thou didst unto Jericho and her King (i.e. kill every man, woman and child). Only the spoils thereof and the cattle thereof shalt thou take as prey unto yourselves." (Joshua 8: 1 – 2).

Unfortunately extermination seems to be sound on rational grounds. Tribes which slaughtered every man, woman and child were unlikely to suffer retribution from their victims, thus, other things being equal, the most heavily armed, well organised and ruthless peoples were the most likely to survive. If these aggressive tendencies were inherited then natural selection would favour the survival of xenophobia and genocidal tendencies, because societies showing them would tend to be materially more successful. Even if there were no hereditary aggressive factors involved, cultural tradition would encourage warrior-like 'virtues' so that the end product would be much the same. The result, whether by natural selection or tradition, would be that the children of the unscrupulous, warlike and cruel would walk the earth as its inheritors whilst the amicable and peaceable lie in their graves these many thousand years.

The final tragedy is that followers of Jesus Christ, who said that "the meek shall inherit the earth" and tried to teach mankind that "those who live by the sword shall perish by the sword", have also resorted to the violence and cruelty which He condemned, this time justifying it in His name.

If my hypothesis is correct, civilised man represents the survivors of a selection pressure not only reinforcing group loyalty and hostility to aliens but also favouring ruthlessness and cruelty. This may explain our readiness to take up arms against aliens.

At present biologists and psychologists are not in a position to solve our problems of aggression and we can offer no instant panacea ; what our studies have taught us, however, is that certain biological factors influence aggressive behaviour and that these are common to both man and other species of animal. Recognising these factors should help us to find methods of mitigating them.

Warfare therefore seems to be caused by man's inherited aggressiveness which is aroused under certain sets of conditions ; inadequate communication between groups, our strong sense of loyalty to our friends, overcrowding, hostility towards unfamiliar individuals and possibly also an appetite for aggression which makes us a potentially highly aggressive species. Our rational nature which gives us the ability to plan ahead, forge weapons, assess the profitability of the spoils of war and our acceptance of diverse ideologies have made war an unique characteristic of our species.

There seems, however, to be little evidence that aggression in man is unmodifiable and instinctive ; it seems capable of some environmental manipulation if the biological substructure is understood, nor do we need to be aggressive in the same way that we need to eat or drink. It is clear that more research needs to be carried out on the factors which influence both human and animal aggression and if more is understood, perhaps we can hope, not to change human nature, but to create environmental conditions in which aggression is less likely to arise.

In conclusion, ethology has thrown valuable light on the animal origins of human aggression and helps us to understand some of the factors responsible for eliciting aggression. This does not imply, however, that man is merely an animal, for each species has its unique behavioural attributes. We must study man as a species using both ethological, psychological, anthropological and sociological methods ; ethology is particularly relevant, however, in that it reveals something of the substructure of our aggressive behaviour and increases our understanding of its motivation.

REFERENCES

1. Carthy, J. D. and Ebling, F. J., *The Natural History of Aggression*, Academic Press, 1964.
2. Schaller, G. B., *The Serengeti Lion*, Chicago, 1972.
3. Verheyen, R., *Monographie ethologique de l'hippopotame (Hippopotamus amphibius* Linne). Institut des Parcs Nationaux du Congo Belge. Exploration du Parc National Albert. Bruxelles, 1954.
4. Wynne Edwards, V. C., *Animal Dispersal in Relation to Social Behaviour*, 1962.
5. Lorenz, K. Z., *King Solomon's Ring*, 1952.
6. Hall, K. R. L. and I. Devore, Baboon Social Behaviour, in Devore, I. (ed), *Primate Behaviour*, 1965.
7. Ardrey, R., *The Territorial Imperative*, NY, 1966.
8. Chance, M. R. A., Social Structure of a Colony of *Macaca mulata*. *British Journal of Animal Behaviour*, 1956, **4**, 1 – 13.
9. Argyle, M., *The Psychology of Interpersonal Behaviour*, (Penguin Books), 1967.
10. Kummer, H. and F. Kurt. A Comparison of Social Behaviour in Captive and Wild Hamadryas Baboons. In Vogtberg, H. (ed.), *The Baboon in Medical Research*, Austin University of Texas Press, 1965.
11. Virgo, H. B. and Waterhouse, M. J., The emergence of attention structure amongst rhesus macaques, *Man*, 1969, **4**.
12. Reynolds, V. and Luscombe, G. Chimpanzee rank order and the function of displays. *The Second Conference of the International Primatological Society, Behaviour* I (ed.) C. R. Carpenter. Basel, S. Karger, 1969.
13. Carpenter, C. R. Sexual Behaviour of free ranging Rhesus Monkeys (*Macaca mulatta*). *Journal of Comparative Psychology*, 1942, **33**, 113 – 142.
14. Scott, J. P., *Aggression*, Chicago, 1960.
15. Lorenz, K. Z., *On Aggression*, 1966.
16. Storr, A., *Human Aggression*, 1968.
17. Hinde, R. A., *Animal Behaviour*, 1970.
18. MacDougall, W., *An outline of Psychology*, 1923.
19. Thomas, H., *The Spanish Civil War*, (Penguin Books), 1965.
20. Milgram, S., Some Conditioning Obedience and Disobedience. *Human Relations*, 1965, **8**, 57 – 76. See also *Obedience to Authority*, (Tavistock), 1974.
21. Freeman, D. Human Aggression in Anthropological Perspective in Carthy, J. D. and F. J. Ebling, *The Natural History of Aggression*, (Academic Press), 1964.
22. Durbin, E. F. M. and J. Bowlby, Personal Aggressiveness and War, in Durbin, E. F. M. and G. Catlin, *War and Democracy: Essays on the Causes and Prevention of War*, 1938.