Besides Darwin’s evolutionary approach to anger and aggression in animals, Craig (1921, 1928) is probably the first scientist – we might call him a proto-ethologist – to seriously consider the issue of animal aggression. Craig (1921) explicitly stated that “even when an animal does fight he aims, not to destroy the enemy, but only to get rid of his presence and his interference”. And he goes on to describe the possible outcomes of such fighting:

“(a) If the reagent flees, the agent does not pursue him indefinitely and seek to destroy him. On the contrary, he pursues him only far enough to eliminate him from the field of interest about which the battle is being fought... there has been an evolutionary change from destructive forms of fighting to forms of fighting which are merely expressive or ceremonial, which drive away the reagent by threatening or warning him without doing him any injury. This is a part of what Hocking (1918) has named the ‘dialectic of pugnacity’... In a great majority of the conflicts among animals, the ceremonial combat is all that is needed and all that is used: the reagent may withdraw as soon as he is threatened; or he may at first make a counterdisplay, but withdraw on discovering that the agent is more determined than he. The physical combat is resorted to only after the ceremonial has been tried and has failed to settle the dispute.

(b) If the enemy submits, the agent ceases fighting. In pigeons this is witnessed again and again. In the heat of battle the agent may rush upon his enemy, jump on his back, peck him with all his might, and pull out his feathers. But if the agent lies down unresisting, the agent’s blows quickly diminish into gentle taps, he jumps off his prostrate foe, walks away, and does not again attack the enemy so long as he is quiet. This behavior is typical, and it proves that the pigeon is devoid of any tendency to destroy his rival.

Further study of this behavior indicates that it is not merely negative, not merely the absence of an impulse to destroy. The bird has a positive impulse to quit fighting a non-resisting bird of his kind. One explanation of this impulse is to be found in the mode of instinctive sex recognition. When a male meets a stranger belonging to his own species, provided this male has not learned by experience to discriminate the sexes, the only discrimination he shows is this: if the stranger fights, the agent treats it as a male; if the stranger refuses to fight, the agent treats it as a female; if the stranger first fights, then submits, the agent treats it first as a male, then as a female. This mode of sex recognition is so widespread in the animal kingdom that it seems to be fundamentally ingrained in the nature of the male. Audubon tells us that when he watched a battle between two wild turkeys, when one of them had been defeated, he was surprised to see that the victor, instead of injuring him, showed toward him the amorous behavior which is generally accorded to the female. Audubon need not have been surprised. Behavior of this sort is now known to be characteristic of a great many animals ranging all the way from the lower invertebrates to the Primates. Thus we see that in the male animal there is a fundamental trait which tends to prevent him, and in most cases does prevent him, from doing any injury to a non-resisting member of his species... in those rare cases in which an animal, or a group of animals, kills a non-resisting member of the same species, such killing is in various ways exceptional or accidental (see e.g. Hudson, 1892); it is not a policy, not a common and regular form of behavior, and very far from being a systematic pursuit.
(c) When the reagent refuses to flee and refuses to submit, the agent is obliged to resort to physical force. It is extremely interesting to notice that even in this case the physical force used is often of a form which serves merely to rid the agent of his enemy without doing him any hurt. Thus, when the common pigeon quarrels with his neighbor on any of the high ledges on which they like to perch, his principal method of dealing with his opponent is to seize him by the nape of neck, drag him to the edge of the ledge, and hurl him off into space. The bird that is thus hurled off spreads his wings and flies without injury.

From what has been said thus far, it is clear that when a pigeon deals with a rival pigeon, his behavior is directed first toward inducing the reagent to flee voluntarily, then toward forcing him off the field. Only when these means have failed, when the reagent refuses to flee, refuses to submit, and is too powerful to be hurled off the ledge, only then does the agent endeavor to the utmost to injure his opponent. Then the two pigeons meet in a grim, silent, unrelenting, physical struggle. This brutally physical struggle appears in extreme contrast to the more common pigeon fights, which are highly ceremonious. Yet even these fiercest struggles, unless they are protracted for a very long time, do not result in the death of either combatant. And at any time when either combatant feels that he has had ‘enough’, he needs only to leave the field in possession of the victor; he thereby saves himself from further injury. For even after the most prolonged and painful battle it still remains true that if the enemy flees or submits the agent ceases fighting” (Craig, 1921).

In the words of Craig (1921): “Defensive fighting pays... No bird or mammal follows a policy of non-resistance... On the other hand, aggressive fighting does not pay. Among animals, as among men, fighting is a wasteful and harmful means toward the attainment of the ends sought by the contestants. In adaptation to this fact, we find that both in the history of the race and in that of the individual there is a trend away from destructive forms of fighting, toward the adjustment of disputes by harmless means”.

“Fundamentally, among animals, fighting is not sought nor valued for its own sake; it is resorted to rather as an unwelcome necessity, a means of defending the agent’s interests... The animal fights in order to gain or to retain possession of that which is of value to him, such as food, mate or nest...Two animals fight only when their interests conflict. This is the fundamental fact in regard to infra-human fighting.

Animals do not enjoy fighting for its own sake. Unless his anger is aroused, the agent’s behavior indicates that he has no appetite (Craig, 1918) for the fighting situation; he does not seek it; when in it he does not endeavor to prolong it; and he reveals by his expressions that he does not enjoy it. On the contrary, fighting belongs under the class of negative reactions or aversions (Craig, 1918); it is a means of getting rid of an annoying stimulus. As McDougall says, the stimulus of the instinct of pugnacity is the thwarting of some other instinct” (Craig, 1921).

“At this point the question naturally arises, Why do animals fight as much as they do? For it is undeniable that under certain conditions there is a very great amount of fighting among them. One of these circumstances is that of caged animals which are crowded so closely together that they constantly fall afoul of one another. Pigeons, if thus crowded in quarters that are too small for them, fight to a degree that is cruel and distressing. Since each pair of birds insistently drive trespassers away from their nest and from a certain territory around their nest, if the pigeon-keeper crowds the nest-boxes too closely together constant fighting must inevitably result... This tendency to ‘keep one’s distance’ is so widespread among animals
and so various in its manifestations that it constitutes a study in itself. It is known to
naturalists as ‘spacing out’.... In short, the reason why animals fight is that they are too stupid
to make peace... The amount of quarreling among animals varies (other conditions being
equal) with the degree of their stupidity. Some individual pigeons are much more quarrelsome
than others. The truculence of some individuals is due to the fact that they were reared under
unnatural conditions which kept them in constant brawls. If as adults they are allowed to live
a free, normal life, they outgrow their excessive quarrelsomeness” (Craig 1921).

Ethology

The three basic components of an ethological approach to behavior can be identified as
concern with physiological causation, with ontogenetic development, and with functional and
evolutionary significance (Hinde, 1966; 1970). Tinbergen (1968) gives a similar account,
suggesting that the questions to be asked about some particular behavior must consider:

(1) what stimuli elicit it and what mechanisms underlie the response (immediate causation);
(2) how the relevant structures and processes develop in the individual organism (ontogeny);
(3) how the species in general has evolved such behavioral system (phylogeny); and
(4) what effects such a response has on the organism’s ability to survive and reproduce
successfully (function).

Ethology involves an integrated attack on these several issues, involving field and laboratory
experimentation, both based on and checked with careful quantitative (as well as qualitative)
documentation of the natural occurrences and contexts of the behavior in the wild.
Comparisons between species can reveal how their behaviors differ in the same context, or
how similar behaviors are to be found in different contexts, thus indicating the variety of
means of achieving a given adaptation and the variety of requirements that a given behavior
may serve.

The ethological emphasis on ‘function’, interpreted both in a broad sense of behaviors being
assumed to be adaptive in the evolutionary context of species survival, and in the narrower
sense of considering the direct effects of a behavior in relation to immediate goals, is in many
ways its most distinctive feature in relation to the human social sciences. The strength of a
comparative approach lies in its ability to provide a unifying framework which can
encompass the whole range of species and their behaviors, viewing survival as a consequence
of being well-adapted to critical environmental conditions (Vine, 1973).

Comparisons both within and between species, from a functional viewpoint, can thus be of
considerable utility in various ways, often giving strong suggestions as to the plasticity of
behaviors as well as informing various aspects of the search for their explanations. Even
purely descriptive similarities and differences may be heuristic, although the demonstration of
true homology, where similarity of characters can be traced back without exceptions along a
single evolutionary line (Simpson, 1961), permits the most confident predictions. The danger
in ethological comparison is that similar behaviors are mistakenly seen as homologous when
they are actually convergent adaptations to certain similarities of ecology, or are by-products
of other behavioral features. They may then be assumed to be strongly determined by fairly
direct genetic linkages when in fact they are very plastic adaptations arising from immediate
environmental learning. It is this error into which the popular ‘ethologizers’ have often slipped through ignorance of the relevant evidence (Vine, 1973).
From the above, it should be evident that there are relatively few cases in which we are likely to be in a position to make confident direct inferences from other species to Man, although we can do so fairly readily with certain aspects of physiological and biochemical functioning and structure. When considering behavior, particularly social behavior, few ethologists do in fact make strong inferences between different species. As Tinbergen (1972) has argued, a human ethology will be most concerned to compare behaviors in alternative human cultures, and between modern cultural man and his less cultural immediate ancestral relatives, about whom fossil evidence can provide some limited clues. The main value of an ethological orientation towards human behavior derives from ethology’s methods of approach and from the utility of the tools it uses. As an avowedly biological science it may help us to set Man within an overall context of being one species amongst many (and indeed a young species whose long-term biological fitness cannot simply be assumed). Its strongly empirical methodology and emphasis on objective description may encourage us to view human behavior afresh, attempting to avoid some of the theoretical presuppositions embedded in the terms with which we usually describe it. The combination of such description with a comparative functional orientation may suggest new and much-needed insights into the nature of Man, provided always that caution is used and specifically human adaptations are not ignored (Vine, 1973).

Tinbergen on human aggression

Tinbergen (1968) noted this striking paradox, when considering the survival value of fighting in animals and man:

“On the one hand, man is akin to many species of animals in that he fights his own species. But on the other hand he is, among the thousands of species that fight, the only one in which fighting is disruptive.

In animals, intraspecific fighting is usually of distinctive advantage. In addition, all species manage as a rule to settle their disputes without killing one another; in fact, even bloodshed is rare. Man is the only species that is a mass murderer, the only misfit in his own society... There are good grounds for the conclusion that man’s limited behavioral adjustibility has been outpaced by the culturally determined changes in his social environment, and that this is why man is now a misfit in his own society... There is a frightening, and ironical paradox in this conclusion: that the human brain, the finest life-preserving device created by evolution, has made our species so successful in mastering the outside world that it suddenly finds itself taken off guard. One could say that our cortex and our brainstem (our ‘reason’ and our ‘instincts’) are at loggerheads. Together they have created a new social environment in which, rather than ensuring our survival, they are about to do the opposite. The brain finds itself seriously threatened by an enemy of its own making. It is its own enemy” (Tinbergen, 1968).

“[A]ggression in animals rarely occurs in pure form; it is only one of two components of an adaptive system. This is most clearly seen in territorial behavior, although it is also true of most other types of hostile behavior... Put very briefly, animals of territorial species, once they have settled on a territory, attack intruders, but an animal that is still searching for a suitable territory or finds itself outside its home range withdraws when it meets an already
established owner. In terms of function, once you have taken possession of a territory, it pays to drive off competitors; but when you are still looking for a territory (or meet your neighbor at your common boundary), your chances of success are improved by avoiding such established owners. The ruthless fighter who ‘knows no fear’ does not get very far. For an understanding of what follows, this fact, that hostile clashes are controlled by what we would call the ‘attack – avoidance system’, is essential” (Tinbergen, 1968).

In man “The upsetting of the balance between aggression and fear (and this is what causes war) is due to at least three other consequences of cultural evolution. It is an old cultural phenomenon that warriors are both brainwashed and bullied into all-out fighting. They are brainwashed into believing that fleeing – originally, as we have seen, an adaptive type of behavior – is despicable, ‘cowardly’...

Another cultural excess is our ability to make and use killing tools, especially long-range weapons. These make killing easy, not only because a spear or a club inflicts, with the same effort, so much more damage than a fist, but also, and mainly, because the use of long-range weapons prevents the victim from reaching his attacker with his appeasement, reassurance, and distress signals. Very few aircrews who are willing, indeed eager, to drop their bombs ‘on target’ would be willing to strangle, stab, or burn children (or, for that matter, adults) with their own hands; they would stop short of killing, in response to the appeasement and distress signals of their opponents” (Tinbergen, 1968).

One may notice that this statement is not absolutely true; there are many instances – especially from civil wars and genocides – of people perfectly capable of burning, or otherwise killing, babies with their bare hands. However, it most cases, for the majority of human beings, the statement is valid.

Ritualized aggression and bonding

Lorenz (1964) relates ritualized aggression and the pair bond as follows: “Indubitably, ritualized aggressive behavior is at least one root of bond behavior. The latter can be defined as the keeping together in space of two or more individuals by a set of responses which each of them selectively elicits in the other. We know neither whether all bond behavior has arisen out of aggression, nor whether ritualized redirection of aggression is its only origin. Both are certainly true for ducks and geese... The bond of lifelong individual friendship keeping together wild geese and determining, by its immense strength, the whole structure of their society, is demonstrably based on the so-called triumph ceremony which, also demonstrably, originated in a way strictly analogous to that of the ritualized redirected attack in Cichlids...

There may be other independent ways in which bond behavior has evolved, but wherever it does, it seems to have done so as a means of controlling aggression, that is to say on the basis of aggressive behavior pre-existing. In the Canidae for instance, in the dog-like carnivores, all gestures and ceremonies of greeting, love and friendship are obviously derived from the expression movements denoting infantile submission. It is quite conceivable that appeasement ceremonies, with high ritualization, have become independently autochthonous motor patterns whose performance constitutes as great a need for the organism as does that of ritualized redirected aggression in the case of the geese’s triumph ceremony.

How much of the primarily motivating aggression may still be contained in ritualized redirected attack, or, for that matter, in any behavior patterns affecting bond behavior, cannot be deduced from their similarity to or dissimilarity from threat and fighting, but must be investigated separately in every single case. In the triumph ceremony of geese there is certainly quite a lot of autochthonous aggression, as can be demonstrated in the
quasi-pathological case of homosexual gender pairs. In these, bond behavior is much more intense than it ever is in normal heterosexual pairs, occasionally reaching a true ecstatic climax. As in other known cases, abnormally high intensity of ritualized activity causes true aggression in Freud’s sense, that is to say to a recrudescence of the phylogenetically older, unritualized behavior patterns. In other words, ritualized redirection suddenly breaks down and the partners proceed to fight with a fury never otherwise observed in goose combat. In Cichlids, even under normal circumstances, the danger of redirection failing and attack being launched at the mate, is forever present. In homicide as every policeman knows, the loving spouse is the most likely suspect, the word ‘loving’ emphatically not being used ironically. The strongest reason, however, which makes me believe that all bond behavior has evolved, by way of ritualization, on the basis of intraspecific aggression, lies in an unsuspected correlation between both. We do not know, as yet, of a single organism showing bond behavior, while being devoid of aggression; in a way, this is surprising, as, at a superficial appraisal, one would expect bond behavior to evolve rather in those highly gregarious creatures which, like many fish and birds, live peacefully in large schools or flocks, but this obviously never happens.

The great assemblies of these animals are always strictly ‘anonymous’, even in the birds of such high organization as starlings, as G. Kramer (1950) has conclusively shown. The dependence of bond behavior on intraspecific aggression is most strikingly demonstrated in those species in which a regular seasonal change takes place between aggressiveness and schooling or flocking. In these cases, whether they concern fish or birds, all individual ties are dissolved immediately when the organism changes from its aggressive to its non-aggressive phase. Also, there seems to be a strong positive correlation between the strength of intraspecific aggression and that of bond behavior...

Of course, the relationship between bond and aggression is entirely one-sided. We have reason to believe that intraspecific fighting evolved millions of years earlier than bond behavior, as indeed all present-day reptiles show the first, while being entirely devoid of the second. But, to the best of our knowledge, bond behavior does not exist except in aggressive organisms” (Lorenz, 1964).

Moyer’s (1969) criticism that there is hardly, if any, neurophysiological evidence for Lorenz’s conjecture is only partly valid and relevant, because the statement ‘no love without aggression’ is a phylogenetic argument, pertaining to the species level. It states that, in species, when there is a pair bond of some kind, there is also more or less intense agonistic behavior. It does not state that, within the individual, a reservoir of hostility gives rise to affiliative tendencies, as Moyer seems to believe.

The ‘spontaneity’ of aggression (Hinde, 1970)

Although some writers (e.g. Marler, 1957; Scott, 1962) treat aggression as depending solely on external factors, others (e.g. Lorenz, 1963) regard it as ‘spontaneous’ and inevitably finding expression. This is clearly an important issue, but hitherto discussion seems to have involved confusion among several questions not necessarily related to each other:

1) **Do changes in aggressive behavior depend solely on external factors?**

The answer here is clearly in the negative: aggressive behavior varies with the hormonal condition or stage of the breeding cycles and with other shorter-term fluctuations in internal state (Hinde, 1970)
(2) **Do animals go out and actively seek for fights?**

This question could be answered in the affirmative if animals showed appetitive behavior in which they visited places where encounters with other individuals were likely, and showed a lowered threshold for responding aggressively to them. This seems to be the case with territorial birds, who patrol their territories apparently searching for rivals and visit the sites of previous encounters. Marler (Cf. Marler & Hamilton, 1966) regards the evidence for appetitive behavior for aggression as inconclusive. However, it is clear that the opportunity to behave aggressively can act as a reinforcer (e.g. Lagerspetz 1964; Azrin et al., 1965; Hautojarvi & Lagerspetz, 1968; Watten & Marony, 1958; Myer & White, 1965; Vernon & Ulrich, 1966; and others).

(3) **Is aggressive behavior spontaneous?**

Spontaneity normally refers to a change in output of a system without a corresponding change in input. Insofar as, for example, two fish left together may fight intermittently and not continuously, the fighting could be called spontaneous: each is continuously exposed to stimulation from the other, but responds only some of the time. Since similar fluctuations occur in the aggressive behavior of one individual towards a dummy, they cannot be due to changes in the external situation. Such fluctuations are presumably due to short-term waning in responsiveness consequent upon responding to the stimulus, and to subsequent ‘spontaneous’ recovery. Defined in this way, spontaneity of aggression clearly occurs.

(4) **Does the tendency to show aggressive behavior increase with time since the last encounter?**

On the one hand there are a number of studies showing that animals reared in isolation may be exceptionally aggressive: in such cases, however, the aggressiveness seems to be at least a semipermanent characteristic of the individual, and the problem is a developmental one. On the other hand, it is a commonplace that temporary isolation, for a period of minutes or hours, may lead to a lowering of the threshold for aggression.

On general grounds an aggressive encounter is likely to have multiple consequences on subsequent aggressive behavior, positive and negative, and decaying with varied time courses. Which predominates will depend on the length, nature and outcome of the initial encounter: if the immediate consequence is an increase in aggressiveness, this may decay with time; but if it is a decrease, the aggressiveness may recover (Hinde, 1970).

(5) **Does aggressive behavior inevitably find expression?**

In conformity with his hydraulic model of motivation, Lorenz (1963) has emphasized the role of an internal drive for aggression which inevitably finds expression. It must be emphasized that a positive answer to the questions (1) to (4) implies a positive answer to question (5) only if one assumes an aggressive drive which accumulates with time and energizes fighting behavior. The shortcomings of such an energy model of motivation have been discussed in Hinde (1970): if we do not make the assumptions it entails, then there appears to be no evidence that aggressive behavior inevitably finds expression. That suboptimal stimulus objects are sometimes attacked in the absence of the normally adequate ones is not in itself sufficient evidence; this could be a consequence of spontaneous fluctuations in the tendency
for aggression which would not be continued until the threshold was nearly zero (Hinde, 1970).

Aggression as motivator?

Lorenz (1950 et seq.) applied his model of energy accumulation to intra-specific aggressive behavior by suggesting that aggression may be released without substantial provocation if it is allowed no opportunity to express itself. Furthermore, Lorenz suggests that aggressive behavior may not only ‘boil over’ when it remains unexpressed, but that an organism may become active and restless and learn to seek out those events that release aggressive behavior; in colloquial terms it may be ‘spoiling for a fight’.

The notion that learning may be motivated by the opportunity to experience a releasing stimulus and to display instinctive behavior was originally proposed by the American ethologist Craig (1918). He termed the learned search behavior ‘appetitive’ and proposed that appetitive and instinctive consummatory behavior alternated in time. Craig did not suggest that all unlearned reactions were accompanied by appetitive behavior. He distinguished appetitive behavior from ‘aversions’ in which the responses were completely reactive, having no spontaneous sources of expression and being unaccompanied by any search or learning behavior. Lorenz has been criticized (e.g. Crook, 1968) for selecting an inappropriate model for aggressive behavior, that is for classing it as being appetitive rather than reactive.

There is evidence that intraspecific aggression can act as a motivator for learned behavior in certain species. Thompson (1963) has shown that male fighting fish will learn new responses when reinforced by exposure to another fighting fish. Thompson (1964) demonstrated a similar effect in fighting cocks. It is difficult to evaluate how widespread such effects may be, for both of the species involved are genetic oddities that have been selected and extensively bred for competitive fighting (Van Somers, 1972).

Eibl-Eibesfeldt (1967) reports that male red squirrels raised in isolation become abnormally aggressive, attacking their caretakers and displaying their species-typical threat responses. Junglefowl (*Gallus gallus spadiceus*), when isolated so that they have no opportunity to fight may finally begin to attack their own tails (Kruijt, 1964). Male cichlid fish may be too aggressive to mate until they have indulged in fighting with other male fish (Lorenz, quoted by Eibl-Eibesfeldt, 1967). Such evidence seems to give same support to the idea of an internal system impelling the organism to aggression (Van Sommers, 1972).

There are examples of motivating effects arising from pain-induced attack. Azrin (1967) demonstrated that pigeons subjected to pain will learn to make a new response if they are presented with another pigeon to attack.

Monkeys will learn to cause an object to appear that they can bite when given painful tail shock (Azrin et al., 1965).

Roberts & Kiess (1964) showed that cats receiving hypothalamic brain stimulation that induced mice-killing would learn to make the appropriate turns in a simple maze to reach a mouse. Such an effect must occur widely in the natural environment of many predatory animals.

Once aggressive behavior has been motivated, the animal may be strongly motivated to continue it. Lagerspetz (1964) showed that mice, when interrupted while fighting a submissive opponent, would cross an electrified grid to continue the attack. The experiment does not bear directly on the question of the initiation of attack. It is more closely related to phenomena such as redirected attack, that is the heightened probability of attack on a second object when attack on the first has been blocked. The phenomenon suggests a lowering of
threshold or a lack of selectivity once aggressive behavior has been initiated (Van Sommers, 1972).

O’Kelly & Steckle (1939) noted that well-integrated attack could be elicited in many animals in response to pain, and the phenomenon has been explored in great detail in laboratory studies (Ulrich, Wolff & Azrin, 1964; Ulrich, 1966).

Attacks elicited by pain are not always indiscriminately directed. At low intensities a rat may react to shock to the feet by attacking another rat, particularly if at the time the two animals are confronting one another. As the shock intensity rises the attack becomes less selective in its target. Pain-induced aggression might be expected to be a widespread if not universal phenomenon among vertebrates. Yet it is distributed among various species and even strains of animals in an irregular way. It is observed in rats but not in guinea-pigs. It appears in snakes, opossums, snapping turtles, and ferrets, but in neither Siamese fighting fish nor in fighting cocks.

According to Azrin (1967), electric shock suppresses fighting in these animals, indicating the special status of their intraspecific aggressive behavior. There are also strong differences between species in the object of an attack by animals subjected to pain. While a rhesus monkey will bite a rod but not another monkey, same strains of rats will attack another rat but not an inanimate object (Van Sommers, 1972).

A number of animals display aggressive behavior when their learned responses no longer lead to the customary reinforcement (Azrin, Hutchinson & Hake, 1965). A rat whose learned behavior is extinguished may attack another rat, the experimental apparatus, or the experimenter.

**Aggression as an Instinct**

Aggressive instinct is, in the main, an accepted notion in psychoanalysis. The various arguments for an instinct of aggression, self-destruction, or destruction may be summarized briefly. Aggression is pervasive and universal, and much aggression cannot be explained on a reactive basis; psychotic acts of murder, suicide, or long-awaited revenge. The phenomena of sadism and masochism indicate the presence of an innate pleasure in inflicting pain on others or the self. There is an unlearned physiological pattern for rage, the predecessor of attack. Finally, aggression occurs so early in development that it must be innate.

As Buss (1961) criticizes, aggression is unquestionably a pervasive and universal response, but so is walking. No one regards walking as an instinct, despite its pervasiveness; a behavior’s being widespread is not a sufficient reason for labeling it instinctual.

Psychotic murder and suicide were suggested by Waelder (1956) as being so far beyond reactive aggression as to necessitate postulation of an essential destructiveness, the death instinct. Apparently, Waelder is impressed with the senselessness of such acts, but behavior cannot be ascribed to an instinctual source merely because it is bizarre and pathological. Unfortunately, there appears to be an implicit equating of rational with learned and of irrational with unlearned or instinctual; while this assumption is never stated clearly in psychoanalytic literature, it would seem to underlie much of the theoretical reasoning about sexual and aggressive instincts.

Sadism and masochism are also offered as indications of the presence of aggressive instinct or death instinct. Again the notion of bizarre or irrational being equal to instinctual appears to underlie this conclusion (Buss, 1961).

There is an unlearned physiological rage pattern, though, according to Buss (1961), it overlaps the pattern for anxiety. Rage is often not followed by aggression, and aggression often occurs in the absence of rage, not only in humans but also in rats (Scott, 1958).
Furthermore, in humans there is no external stimulus that is guaranteed to evoke rage; rather, the rage reaction is one that becomes conditioned to a number of antecedent events, and there is much variability among individuals in the stimuli that evoke rage. Thus the presence of an unlearned physiological pattern of rage is not a sufficient reason for postulating an aggressive instinct.

Finally, the appearance of aggression very early in the developmental sequence has been used as an argument for regarding aggression as an instinct. But attacking behavior occurs no earlier than talking or walking; like them, it requires some maturation, and, like them, aggressive responses must be learned (Buss, 1961).

**Criticisms of Lorenz’s theory**

Lorenz’s account of the proximate determination of aggressive behavior is based upon a formulation of motivation theory largely developed by him in the classical ethology of the 1930’s. According to his famous ‘hydraulic model’ of instinctive behavior (see Lorenz, 1950) the performance of fixed action patterns, such as are shown in sexual behavior or feeding, depends upon the accumulation of energy specific to these activities in centers in the conceptual nervous system. Release of this energy occurs when appropriate stimuli are provided, but in the absence of stimulation the energy must sooner or later find an outlet in relation to an inappropriate stimulus or even *in vacuo*. Lorenz has commonly used the apparent spontaneity of behavior under minimal stimulation as support for this view.

However, the occurrence of aggressive behavior seems rarely to fit such an account even descriptively. Lorenz’s ideas were in large measure based upon Wallace Craig’s (1918) distinction between the appetitive and consummatory phases of cyclic drives. According to Lorenz’s account the action-specific energy appears first as appetitive behavior and finds outlet in the performance of the consummatory act. In considering aggression Lorenz ignores, however, Craig’s (1918; 1928) further and more important distinction between ‘appetites’ and ‘aversions’. Aversive behavior is a response to undesirable or harmful stimulation and persists until the individual flees or until the stimulation is removed. Aggression, which Craig described as an ‘aversion’, occurs in the social context only on the appearance of an offending individual and continues until one or other of the mutual offenders goes away. According to this account, aggressive behavior is nonrhythmic and lacks an appetitive phase (Crook, 1968; c.f. also Marler & Hamilton, 1966).

Lorenz’ theory of aggression, of course, has been highly controversial and has prompted a number of serous criticisms varying widely in quality. Leaving aside for the moment such ascientific questions as the societal effects of Lorenz’ view of human nature, he has been severely attacked for the inadequacy of both his data and his logic.

There are two critical questions in evaluating Lorenz’ theory. First, how valid is his theory for animal (i.e. nonhuman) behavior? How accurate, complete and generalizable is it? And second, how well does the theory apply to human behavior?

**1) Applicability to animals:** Aside from near-hysterical outbursts from literati, Lorenz’ most severe critics have been his fellow professionals working in animal behavior and related fields. It is interesting that many reviewers who do not specialize in any such related fields have been willing to assume the validity of Lorenz’ animal evidence but feel he has erred in applying these results to humans, whereas many specialists in these areas feel that his conclusions about animals are fundamentally wrong. Barnett (1973) goes so far as to say that
Lorenz’ book “does not in fact represent the methods or opinions current in ethology”. Scott (1973), Crook (1968; 1973), Gorer (1973), and Berkowitz (1969) all charge in one form or another that Lorenz’ notions are outdated, that he has ignored the bulk of experimental literature in the field, and that his expertise is limited to only a few species of animals. Some writers have charged that the data from which Lorenz generalizes and with which he is intimately familiar are either artifacts of the setting or specific only to a few selected species. Carrighar (1968; 1973) alleges that Lorenz’ use of ‘tamed’ animals in captivity (e.g. geese and fish) has resulted in abnormally heightened aggressiveness. Meyer-Holzapfel (1968), Pilbeam (1973), and Zuckerman (1932) all provide evidence that captivity may in fact enhance social conflict and aggression. Also, irrespective of captivity, crowding may have had the same effect (Schneirla, 1973; Carrighar, 1973). Also, Carrighar suggests that Lorenz has used only animals who demand ‘individual distance’ (e.g. birds and fish) and dislike close association with their conspecifics. By contrast, mammals – to which humans belong – are ‘contact’ species – that is, they seek and enjoy the touch of their own kind. However, there is some inconsistency on this point, for Crook (1973) states that there are ‘contact’ and ‘distance’ species among both birds and mammals. Lorenz also shows weakness in his knowledge of primates, in one place referring to them as ‘irascible’, whereas the consensus generally is that, except for the usual kinds of ritualized ‘aggression’, primates and especially man’s nearest relatives, the anthropoid apes, are quite ‘amiable’ (Montagu, 1973) in their natural environment. Lorenz’ assumption that aggression is a general, unitary drive has come under attack from several writers, including Berkowitz (1969), who cites Moyer’s work (summarized in Moyer, 1971) which suggests that “there are several kinds of aggression, each of which has a particular neural and endocrine basis”. Further, Lorenz’ assertion that social, affective bonds are derived from the aggressive instinct is contradicted by Harlow’s famous monkey studies, which showed that affection developed first, followed by fear, and then aggression (Berkowitz, 1969; Nelson, 1974).

A number of writers have found fault with Lorenz’ notion of the ‘spontaneous’ nature of aggression. Berkowitz (1969) cites two nonconfirming sources; Hinde’s (1960) suggestions that stimulus satiation may account for reduced elicitability of response rather than an ‘exhaustion’ of ‘action-specific energy’, and explanations by Hinde and Ziegler (1964) separately “that many apparent demonstrations of internally-driven spontaneity can be traced to external stimuli and the operation of associative factors”.

Other writers have questioned whether the spontaneous discharge of aggressive energy, which would unnecessarily thrust the organism into danger, could have evolved at all, being contrary to natural selection (Bartlett & Bartlett, 1971; Scott, 1973). Summarizing his critique of Lorenz’ notion of spontaneity, Crook (1973) states: “In any case, the whole structure of motivation theory in ethology has undergone a major conceptual revision in recent years and even if aggression could be classified descriptively as an ‘appetite’, the simple Lorenz-Ardrey account of its causation would have to be severely modernized”. Often forgotten in the attention to aggression is the fact that animals have a second major, and probably more frequently used, response to threat, namely flight (Tinbergen, 1968; Fromm, 1973). For most species under such conditions, fighting is only a last resort when flight is not possible. Fromm (1973) comments on Lorenz’ downplaying of this response:

“In no manner is aggression more ‘natural’ than flight. Why, then, do instinctivists talk exclusively about the intensity of the innate impulses of aggression, rather than to speak with the same emphasis about the innate impulse for flight?... A theory centered around man’s ‘uncontrollable flight instinct’ may sound funny, but it is neurophysiologically as sound as that of ‘uncontrollable aggression’. In fact, from a biological standpoint it would seem that...
flight serves self-preservation better than fight...The speculations (omitted here) are only intended to point to the ethological bias in favor of the concept of *Homo aggressivus*.

Barnett (1973) criticizes Lorenz for confusing heredity and development and for failing to take account of how behavior develops throughout the organism’s life. It is mistaken to assume that mere uniformity of behavior within a species is evidence of innate factors. Hunt (1973) describes cases in which some ethologists, formerly committed to traditional notions of ‘fixed action patterns’, upon closer examination discovered that some of these behavior sequences were actually molded to a great extent by particular environmental opportunities and learning experiences. And finally, Scott (1973) claims that Lorenz simply leaves out the other major causes of aggression, such as differential heredity, training, and social disorganization.

(2) Lorenz’s cross-species comparisons: Under any circumstances, it is risky to make cross-species generalizations of physiological commonalities assumed to underlie behaviors that appear similar. Lehrman (1953) states that “it is not very judicious, and actually is rask... to assume that the mechanisms underlying two similar response characteristics are in any way identical, homologous, or even similar” simply on the basis of apparent similarity of behaviors across species – similarity which, Berkowitz (1969) adds, may be only in the eye of the beholder. However, Lorenz is particularly loose in making such assumptions. As Alland (1959) puts it, “Lorenz has a tendency to describe animal behavior anthropomorphically, and to reverse his field and attribute animal-like responses to man when it suits his arguments”. Both Eisenberg (1972) and Berkowitz (1969) accuse Lorenz of acting as if he has ‘explained’ such behaviors simply by attaching the same labels to them, thereby “misrepresenting analogy as homology” (Eisenberg, 1972).

(3) Applicability to humans: Fromm (1973) distinguishes two quite different kinds of aggression among humans: benign and malignant.

“The first, which man shares with all animals, is a phylogenetically programed impulse to attack (or to flee) when vital interests are threatened. This defensive, benign aggression is in the service of the survival of the individual and the species; it is biologically adaptive and ceases when the threat has ceased to exist. The other type, malignant aggression, i.e. destructiveness and cruelty, is specific for the human species and is virtually absent in most mammals; it is not phylogenetically programed and not biologically adaptive”.

Only the second type of aggression, says Fromm, is ‘evil’, and it is not instinctive at all but rather distinctly human and part of man’s own doing. Fromm’s distinction is a good one, but in real life it is hard to preserve in such clear-cut form (Nelson, 1974).

One of the most striking characteristics of human beings is their impressive diversity of culture. Practices may vary enormously from culture to culture. The same behavior may be praised or taken for granted in one culture and may be pilloried and condemned in another. Eisenberg (1972) describes the difficulties that such diversity poses for the theory of instinctive aggression:

“If we explain the murderous raids of Brazilian Indians on the basis of an innate aggressive instinct, we shall have to invent an evolved theory of repression, reaction formation, and sublimation to account for the peacefulness of the Eskimo. Would it not be far more parsimonious to begin with the assumption that men are by nature neither aggressive nor peaceful, but rather are fashioned into one or another as the result of a complex interaction
between a widely, but not infinitely, modifiable set of biological givens and the shaping influences of the biological environment, the cultural envelope, and individual experience?”

Lorenz’s suggestions for dealing with aggressiveness in humans have also come under attack. Drawing on his own extensive experimental research, Berkowitz (1969) concludes that aggression excites rather than deflates aggressive urges. This point is supported by Moyer (1973), who cites soccer riots in several countries as well as research by Goldstein & Arms (1971), who found much greater hostility and irritability in fans who had watched a football game than among fans who had attended a gymnastics match. There is enough research to conclude, says Berkowitz, that aggression is likely to lead to even more, not less, aggression. And even Desmond Morris (1968) disagrees with Lorenz, preferring ‘massive de-population’ to ‘boisterous international football’ as the key to lowering the level of human aggression.

In addition to these rather specific criticisms, it should be noted that Lorenz’ theory ignores the role of three major classes of determinents of aggression in humans: learning, structural causes, and ‘semi-autonomous’ psychological causes (Nelson, 1974).

(a) Learning: Learning may modify, subordinate, or replace physiologically determined aggressive impulses. Learning mediates the acquisition of aggressive behavior in many different ways. Aggressive behavior is learned by observation of others (Bandura, 1973) or by direct experience. Children learn that aggression is often highly instrumental, useful, effective behavior and that it is often reinforced. They also learn that the successful use of aggression often is a function of one’s power over others. They are surrounded with examples of aggression and may become desensitized to media displays of it (Cline, Croft & Courrier, 1973). Eisenberg (1972) summarizes the point well:

“The very ubiquity of violence in Western society, however we explain its genesis historically, guarantees that children are surfeited with opportunities to learn violent behavior. The child sees that violence pays off; he is provided with adult models of violent behavior with whom to identify (television pales beside real life). Violence as an appropriate response to the resolution of intergroup conflict is sanctioned by national leaders... When violence is sanctioned, it will increase. It can be expected to generalize to situations not ‘intended’ to come within official pardon. Learning may not account completely for human aggression, but the social forces in contemporary society that encourage its development are so evident that preoccupation with hypothesized biological factors is almost quixotic”.

However, most prolearning writers do not discuss the very real possibility that humans may be biologically predisposed to easily learn aggressiveness through specific mechanisms.

(b) Structural causes: Also ignored by Lorenz are the many structural forces which promote conflict and aggression in humans. Scott (1969) and Fromm (1973) suggest that just as social disorganization in animal societies leads to greater overt aggression, its analogues in human society – poor international organization, and normlessness and lack of community – also predispose humans toward aggression and violence. Further, a great deal of human conflict stems from the fact that human groups often have incompatible goals and are engaged in competition over scarce resources. Such conflicts and much behavior then are ‘realistic’ (Campbell, 1955; Levine & Campbell, 1972), rather than instinctual in origin. If the vast number of Prisoner’s Dilemma studies which have filled the pages of the ‘Journal of Conflict Resolution’ have shown anything at all, it is that, in a wide range of situations characterized by particular strategic or motivational patterns, what appears to be ‘hostile’, ‘destructive’ or
‘selfish’ behavior is not at all the result of ‘innate aggression’ or the characteristics of the actors, but instead are conventionally (i.e. individualistically) rational decisions in the context of a very difficult situation (Nelson, 1974). Such problems are structural, not biological in nature. And finally, Bartlett & Bartlett (1971) argue that Lorenzian notions of aggression – especially when misused as by Ardrey (1951; 1955) – both ignore and detract attention from exploitation:

“This science precludes criticism of social structures and thwarts genuine inquiry into the human practice of exploitation. The convulsive current thrust of the exploiting classes to keep in their grasp the earth and its people is accepted by these authors as the action of the instincts. The question: Who gains by the power to exploit? is put outside the realm of science”. Similarly, blaming ‘technology’ for the human abuses of technology and of other humans masks questions of what groups of people have created it, own it, and use it, and for what purposes (Nelson, 1974).

(c) Psychological factors: The proponents of biological explanations of human conflict fail to appreciate adequately the role that symbolic issues often play in causing conflict or even aggression. (The most immediate example is the very controversy under review here, which is at least in part a conflict over an ‘image of man’). Whereas animals’ aggressive drives lead them to attack only actual enemies who present an actual threat, “man...by virtue of his ability to manipulate symbols, attaches the label ‘enemy’ to entire categories of things: other animals, other people – even inanimate objects and ideas. Accordingly aggression ceases to be ruled by the situation” (Rapoport, 1965) – or, one might add, by one’s physiology. Fromm (1973) and Erikson (1956) even suggest that it may not be accurate to refer to some human aggression as intraspecific, since the victims of much violence are not even thought of as fellow humans.

Another psychological dimension thought to lead to human aggression – although it may have immediate social-structural roots – is the feeling of powerlessness or helplessness. More specifically, in several well-documented cases of urban disorders, the operative factor was found to be a combination of the lack of political efficacy together with a high sense of personal efficacy (Caplan, 1971; for a more comprehensive treatment of structural and psychological inputs to conflict, see Nelson, 1971).

Ethologists, like the individuals in any other discipline, are not of a single mind on the subject of aggression. However, if there is anyone among them who has come to be associated with this topic, it is Konrad Lorenz. His theory of aggression (Lorenz, 1966) deserves coverage here not because it is representative of the field – it is not (although when given the opportunity in print, several prominent ethologists have declined to offer substantive criticism) – but for a number of other reasons. He is considered one of the founders of ethology – if not the founder – and is thought by many nonethologists to be its spokesman. Further, his account is probably the most extreme offered by a responsible scientist and is certainly the best known. For these reasons, it is the one which anyone writing in the area of aggression has to deal with sooner or later (Nelson, 1974).

Very simply, Lorenz believes that aggression in human beings stems from an ‘instinct of aggression’ that humans share with most other species. Strictly speaking this is intraspecific aggression which has evolved because of its alleged survival value for most species. Contrary to what one might expect, intraspecies aggression is not dangerous or maladaptive to the species, at least among nonhumans, because together with this aggressive instinct have evolved ‘instinctive’ inhibitory mechanisms including the ritualization of aggression (enabling the receiver to instinctively recognize the aggressor’s behavior as being different
from a real mortal attack) and gestures of appeasement or submission which cause the aggressor to instinctively terminate the attack.

Lorenz accounts for the impressive degree of aggression among humans by suggesting that they have no such instinctive inhibitions to aggression. This is so, he says, because early in man’s evolution, such inhibitions were not necessary. Man’s physiology contained no terribly dangerous weapons on the order of the wolf’s teeth and jaws or the lion’s claws, with which to kill his conspecifics with dispatch; consequently, no (or only weak) compensating inhibitory mechanisms were evolved. However, according to Lorenz, the invention of ‘artificial weapons’ upset the natural balance between instinctual aggression and killing potential on the one hand, and the weak inhibitions against aggression on the other. Over time, things got out of hand because of the weapons’ increasing effectiveness for killing as against the still-feeble innate inhibitions against killing. In more modern days, this imbalance has been further exacerbated by the lack of immediacy or direct experience with the victim’s suffering, a condition afforded by increasingly effective long-range weapons.

One of Lorenz’ fundamental assumptions is that “human behavior is fueled and motivated, directly and indirectly, by ‘spontaneous’ instincts physiologically identical with those of animals lower on the evolutionary scale” (Willhoite, 1971). Energy specific for the performance of aggression accumulates in the central nervous system, generating pressure for its release by appropriate stimuli. If the appropriate stimuli are not present, the organism may seek them put for release, a process called ‘appetitive behavior’ (Eibl-Eibesfeldt & Wickler, 1968).

Or if none are found and energy accumulates beyond a certain point, the behavior may ‘explode’ in the absence of any relevant external stimuli. However, once sufficient behavior has been enacted to exhaust the previously accumulated energy, normal releasing stimuli are ineffective in getting the organism to respond until sufficient energy can accumulate again in the ‘instinct center’. Lorenz also conceives of the aggressive instinct as a general, unitary drive capable of powering a wide range of other behaviors as well. He speculates that social, affectional bonds may be derived from diverted aggressive energy, and that smiles of greeting may be a result of ritualized, redirected aggression. Because Lorenz conceives of aggression as an ‘ineradicable instinct’, his prescriptions for dealing with it understandably concern ways of rechanneling it rather than trying to eliminate it entirely. Because he feels that the society makes impossible demands upon the individual for suppressing his ‘natural’ instincts, what humans need is ‘ritualized’ release: their aggression needs to be redirected into socially beneficial or at least harmless channels such as space ventures or international sports (Nelson, 1974).

**Achievement motivation**

Contrary to the Lorenzian assertion, there is no evidence in the studies of achievement motivation that aggression is indispensable for intellectual pursuit. In the best-known study of achievement motivation, McClelland et al. (1953) concluded that there was no correlation between the instigation to aggression and achievement motivation.

It has also been reported (New York Times, 1971) that violent living conditions, in the black ghettos of American cities impede a child’s intellectual development. Based on their experimental study of ghetto school children in Washington D.C., psychologists Gordon and Meers conclude that “the constant atmosphere of violence of the ghetto, absorbed into the unconscious in the form of fantasies, had arrested ego development” which is believed to be essential to reality perception or learning (Kim, 1976).

Indeed, there is much to be said for the hypothesis that aggression, far from being normal, healthy or indispensable, is a pathological symptom (Kim, 1976; Scott, 19??).
The Ambivalence Hypothesis

A current ethological hypothesis which has helped to ‘reduce’ the intricate social behavior of a number of animal species to a few simple factors such as aggression, flight and sex, is the ambivalence hypothesis. According to this hypothesis it is for instance possible to interpret the whole of a species’ fighting behavior as a product of the activation and interactions of two major drives or tendencies: attack and escape. Or one may understand the whole of a courting behavior as the outcome of interactions between three such factors: attack, escape and sex. In the course of its existence the ambivalence hypothesis has become underpinned with a variety of analytic studies mainly concerned with relative frequencies or patterns of alternation between agonistic or courtship displays on the one hand, and ‘pure’ attack, escape and sexual activities on the other (For a review see Hinde, 1966). Though the correlations found in such analyses are often in accordance with the ambivalence hypothesis, they certainly seem to leave room for alternative interpretations (see e.g. Kortmulder, 1972, p.86). Apart from such analyses the ambivalence hypothesis derives much of its cogency from assumptions such as the one that a potential sex partner, being a conspecific, does not only elicit sexual responses but aggressive and fear responses as well. Incompatibility between these responses then leads to the various kinds of conflict behavior which are thought to constitute courtship. Such an assumption may seem a matter of course in, for instance, a territorial animal, for which a potential sex partner entering its territory is at the same time an intruder and thus a potential rival. If it is true that a function of territory is to ensure some degree of undisturbed mating, it would seem obvious that a territorial animal’s first concern should be to attack any intruders and only secondarily to court one after having identified it as a willing partner. A similar reasoning may be made to apply to animals in which group hierarchy is important (Kortmulder, 1974).

The ambivalence hypothesis has been called in question by a number of authors (Manley, 1960 – Swoop and Soar display and pair-formation ceremonies in black-headed gulls; Miller & Hall, 1968 – Lateral Spread display in the pearl gourami; Brown, 1964 – Agonistic behavior in Steller’s jay; Brown & Hunsperger, 1966 – Agonistic behavior in the cat; Kortmulder, 1972 – Threat in Barbus species). Further it may be noted that some detailed studies of courtship (Baerends, Brouwer & Waterbolk, 1955 – guppies; Nelson, 1964 – glandulocaudine fish) arrive at a quite satisfactory analysis on the basis of just one, sexual, kind of excitation. The alternative interpretation, in terms of ambivalence, given by Baerends et al. adds very little indeed to an understanding of Lebistes courtship.

Often, if the results of an analysis do not fit the ambivalence hypothesis, the solution is sought in phylogenetic perspective: the displays were ambivalent originally but they have now become ritualized or emancipated from their original dependence on conflict. Now, of course, such a solution is difficult to test. Moreover, it has a somewhat disquieting resemblance to the old myth of primeval man being a kind of uninhibitedly aggressive butcher who only slowly got ‘tamed’ by culture.

However this may be, for non-territorial animals without a fixed rank-order the ambivalence hypothesis is not a matter of course. In such animals other sources of conflict may be looked for. For instance, it may be argued that mating requires a very close proximity to a conspecific and the anticipation of this may stimulate aggression and/or fear; or thwarting of the initial sexual response may generate conflict (Bastock, 1967). Still, it is by no means certain that all courtship may be explained in such ways. Kortmulder’s (1972) observations on courtship of non-territorial Barbus species, for one thing, wouldn’t seem to fit any of the above suggestions. Moreover, if it is assumed that close proximity leads to courtship display
through stimulation of aggression and fear, it may be asked why such antics are virtually absent in other kinds of behavior involving close proximity, such as schooling and aggregation and non-sexual forms of contact behavior. Kruijt (1964) made an important suggestion when he wrote that in the three-point conflict which (according to the ambivalence hypothesis) underlies courtship the sexual factor, instead of merely playing a role on an equal footing with aggression and fear, may at the same time shift and stabilize the balance between the other two. This is important because it means a partial emancipation (logically, not phylogenetically) of the presence of aggressive and fear components from direct external agonistic stimuli (Kortmulder, 1974).

**Some Sociobiologists on Aggression**

The whole question of animal aggression has fascinated evolutionists right back to Darwin: indeed, it fascinated pre-evolutionary biologists no less, as they wrestled to harmonize nature ‘red in tooth and claw’ with the supposedly benevolent omnipotence of the Christian God (Ruse, 1979). For Darwin, who used the struggle for existence to fuel natural selection, aggression was a fundamental, vital, and pervasive facet of animal existence, although as a matter of fact his ‘struggle’ covered a far wider range of things than just two animals battling to the death; extending metaphorically for instance to a cactus ‘battling’ against drought, and a pretty flower ‘struggling’ with its fellows to get attention from insects (Ruse, 1979). In recent years, the whole question of animal aggression has been much illuminated, not to say popularized, by the writings of a number of so-called ethologists, most particularly Konrad Lorenz. In his fascinating and deservedly well-known book, *On Aggression*, Lorenz (1966) argues at length that the traditional view of animal aggression as an inevitable bloody battle to the end is quite mistaken, particularly as applied to conflict between animals of the same species. Certainly, one gets a struggle to the death when, say, a lion attacks an antelope: if one did not, then the lion would never get its supper. But fights between animals of the same species, a very common kind of animal aggression, are quite otherwise. They involve a kind of social interaction, something we might be loathe to apply to a prey-predator situation. The fighting is always restrained, involving ritual, bluff, and violence of a non-fatal kind. And moreover, there are appeasement gestures that can be made by an animal losing a conflict, so that the winner will not follow through to the kill. Dogs, for instance, will present their bellies to an overwhelming attacker, at once defusing the fury of this aggressor. Furthermore, it seems that, generally, animals do not like the taste of their own conspecifics; consequently, animals that prey on others have no motive to pray on their fellow species’ members. Indeed, argues Lorenz, so effective are the restraining mechanisms, that:

“Though occasionally, in territorial or rival fights, by some mishap a horn may penetrate an eye, or a tooth an artery, we have never found that the aim of aggression was the extermination of fellow-members of the species concerned”.

So much for fact; what about the theory? The aggression of an animal against another to defend its nest or to gain its supper is easily explicable in terms of Darwinian selection. But why should there be any aggression at all between animals of the same species, although there undoubtedly is, and why then given this aggression should there be so much restraint? At this point, Lorenz invokes group selection hypotheses: aggression between conspecifics exists to pick out the best members of the species, so that these will provide the breeding stock for the future, the species’ best interests being served by having the best members as parents.
Equally, however, it is in the speciest best interests not to have any of its members wiped out, particularly since the weaker usually include the younger, and so group selection perfects all of the limiting mechanisms. “The environment is divided between the members of the species in such a way that, within the potentialities offered, everyone can exist. The best father, the best mother, are chosen for the benefit of the progeny. The children are protected” (Lorenz, 1966).

Complementing this view of the animal world are a few wise but sad words about the human predicament. Somehow, in our case, selection has gone wrong. We no longer seem to have the near-infallible restraining mechanisms of the brutes. When faced with fellow humans, we are killers: An “evil intraspecific selection” set in during the early Stone Age, and as a consequence we humans can no longer keep our animosities within check. We therefore wage wholesale war on other humans. Science confirms religion, for, verily, humans are tainted with original sin (Ruse, 1979).

This scenario of animal aggression, taken almost as gospel by many these days, has been challenged by sociobiologists both with respect to fact and to theory.

By this point, one may be wondering why Lorenz was so absolutely wrong. The sociobiologists argue that the mistakes are both possible and actual, because to establish the full truth about animal aggression (and indeed about animal behavior in general), one must have very long-time studies of animal behavior in the wild, and only now are these beginning to obtain. About murderous behavior in animals, Wilson (1975) writes: “I have been impressed by how often such behavior becomes apparent only when the observation time devoted to a species passes the thousand-hour mark”. And somewhat to underline his point, Wilson goes on to add that one murder per thousand hours is a great deal of violence by human standards, and in fact he suggests that with present information, even taking account of human warfare, compared to the rest of animal creation human beings are starting to look very peaceful beings indeed. We are far less dangerously aggressive than many animals, not excluding apes.

The ethological claims as to the facts of animal aggression are therefore challenged. As might be expected, Lorenz’s group selection hypotheses are also questioned. In particular, the sociobiologists want to work from, and only from, individual selection. Now, in a sense, they can do this easily; perhaps even more easily than someone like Lorenz. The sociobiologists make no a priori assumptions about the good of the species, and hence have no need of special explanations as to why one organism might attack a fellow. Thus, all other things being equal, in the eyes of the sociobiologists the parasitic wasp larva is indifferent as to whether it is attacking a fellow or a member of a different species. Another organism means food, or competition, or something. And more generally, the sociobiologists, Wilson in particular, see animal aggression as explicable in terms of a competition “for a common resource or requirement that is actually or potentially limiting” (Wilson, 1975). There is only so much to go round, and aggression ensures that an animal gets its share, or more. Since conspecifics usually want the same thing, there is no wonder that there is competition and aggression within species. Furthermore, points out Wilson, aggression can vary according to need. In particular, when resources are very limited, aggression often escalates, or animals show other sorts of bizarre behavior. Cats which are overcrowded become despotic and frenzied attacks occur on some which become pariahs. Rats show hypersexuality, homosexuality, cannibalism and other behavior which is, in the circumstances, ‘abnormal’ (Wilson’s word). All of this can be directly understood in terms of Darwinian adaptive advantage (Ruse, 1979).

**Human aggression**
For a start, we have seen that Wilson believes that much animal aggression is adaptive, being directed towards the gaining of limited resources. “Nonsexual aggression practiced within species serves primarily as a form of competition for environmental resources, including especially food and shelter” (Wilson, 1975). And he sees it as being triggered by a number of factors, most particularly by the arrival of strangers. “This xenophobic principle has been documented in virtually every group of animals displaying higher forms of social organization”. In an identical manner, Wilson sees aggression in humans, not as some murky trait showing our essentially blood-lust character, but as something widespread and of great adaptive significance for the survival and reproduction of the individual, most specifically when such an individual is faced with competition for limited resources, such as food or just general living space. Moreover, although Wilson expresses indifference as to whether aggression is genetic or learned, it is clear that in the most essential sense Wilson thinks aggression genetic or innate. Certainly, he likens our responses under stress to those of other organisms where any aggressive responses most definitely are genetic. Thus cats and Norway rats get really aggressive and bizarre under extreme crowding conditions. And there are “some clear similarities, for example, between the social life of [restricted] rats and that of people in concentration and prisoner-of-war camps, dramatized so remorselessly, for example, in the novels Andersonville and King Rat” (Wilson, 1975). Furthermore, human response to strangers parallels closely the responses of other animals: intuitively, we put up barriers to strangers, foreigners, outsiders, and the like. They are the Yids and Wobs and Spicks (Ruse, 1979).

Alexander (1971 et seq.) argues that somewhat paradoxically much of the human ability to live socially together (which Alexander sees as being underlyingly genetic) is ultimately an outcome of aggression. It is often suggested that humans started to band together and to evolve rapidly as a function of hunting – ancestral humans needed to work together intelligently in order to secure prey far bigger, fleeter, and stronger than they. However, Alexander finds this explanation alone unconvincing, particularly when coupled with the deleterious effects of group living, such as the greater likelihoods of disease and parasites. He believes that sociability and intelligence, not to mention aggression, are adaptive responses to predators competing for similar resources, namely other bands of humans. “I suggest that, at an early stage, predators became chiefly responsible for forcing men to live in groups, and that those predators were not other species but larger, stronger groups of men” (Alexander, 1971). It should be added that Alexander does not just suppose a straight survival-of-the-fittest cause for intelligence growth, but that he invokes kin selection also. In particular, Alexander suggests that there would be selection for ability to discriminate between kin (friends) and nonkin (enemies): this ability being intelligence (Ruse, 1979). So far, we have just been considering aggression without restriction. What about human aggression with restrictions? Again, it is to Alexander that we might most profitably refer. Contra Lorenz and others, “man, who clearly has the most elaborate and complicated selfish inhibitions to aggression in the animal kingdom, may also possess the ability to preserve his species from the destructiveness of his aggression” (Alexander, 1971). And Alexander makes very clear that in his opinion this ability to help the species is only a function of the individual human ability to help itself. In particular, Alexander pursues the same kind of reasoning as do those who apply game theory to animal aggression: all-out attack if one is certain of winning is fine; but if the probabilities of success are much lower, or if the probabilities of cost whatever the outcome are much higher, then a strategy of restrained aggression may be the best policy. “The worst kind of animal on which to press an attack with a low probability of gain, after all, is one that has lethal weapons; if you kill him but receive a mortal or disabling
wound in the process, you are certain to lose rather than gain. Lions and tigers ...seem not different from nations with nuclear weapons in this regard” (Alexander, 1971).
Furthermore, in support of his position on restrained human aggression, Alexander refers to anthropological data on various ‘primitive’ tribes: often these go through all kinds of threatening and bluffing procedures with opponents. Rather than seeing ritualized play, in itself somehow inhibiting violence, Alexander suggests that we may well be watching ferocious opponents testing out the opposition, before deciding that an all-out conflict is not in their self-interest. (Since Alexander tends to see small bands as kin, there is no suggestion of a group-selective mechanism at work here.) (Ruse, 1979).

**Eibl-Eibesfeldt’s Ethiological Approach toward Aggression**

Numerous ethological studies have long confirmed that intraspecific aggression developed as a mechanism of spacing either by force or by display in the animal kingdom (Eibl-Eibesfeldt, 1977). Aggression is part of what Scott (1960) called the ‘agonistic system’, which includes aggression and defense on one side, and submission and flight on the other. Aggression evolved independently in different animal groups, and the mechanisms underlying it are therefore not homologous throughout the animal kingdom. Nonetheless, the study of their analogous development teaches us the laws of function according to which the patterns are shaped independently of any taxonomic relationship (For a detailed discussion see Eibl-Eibesfeldt, 1975b). Aggression is a widespread phenomenon, indicating that strong selection pressures have favored its development. Among its most obvious functions are the competition for mates, natural resources, and territories, and the preservation of the group identity in gregarious species (Eibl-Eibesfeldt, 1977). Given this fact, we can expect that fighting behavior is, to a certain extent, preprogrammed by phylogenetic adaptations. This is not to say that learning does not play an important role in its individual manifestation.

Following are some basic concepts of contemporary ethology:

**Inborn motor patterns**

Deprivation experiments have demonstrated that motor patterns which have evolved in the service of aggression are part of the inborn movement repertoire of the species (‘Erbkoordinationen’). Marine iguanas deprived of all social experience perform the head-butting combat exercises in the same way as conspecifics raised under ‘normal’ conditions. Lava lizards (*Tropidurus*) growing up in social isolation fight by lashing their tails in the species-specific manner. Cichlid fishes raised in isolation display the species-specific behavior patterns of threat and mouth fighting. Fighting cocks as well as rats, without social experience, fight in the species-specific way (Eibl-Eibesfeldt, 1975a). These and many other experiments have yielded strong evidence that a large number of animals are born with the particular movement patterns used for fighting. But it is not only in the realm of motor patterns that we observe the results of phylogenetic adaptations.

**Releasing stimuli (releasers)**

Aggressive behavior in numerous vertebrates is released by particular stimuli characteristic of conspecifics. These stimuli can easily be reconstructed in a model. Robins, for instance, respond to the red patch on the chest of a rival by attacking him. If we mount the plumage of one robin in the territory of another male, the latter will attack. If, however, the red feathers
are removed, the robin will ignore the rest. But a simple bundle of red feathers tied to a branch will draw the attack of the territory holder (Lack, 1943). Males of the Fence lizard (*Scleroporus*) sport blue stripes at the side; females of the species are gray. If we reverse the situation and paint blue stripes on the female, she will be attacked. If we cover the blue stripes of the male, he will not be attacked by other males (Noble & Bradley, 1933).

Male sticklebacks react to the red belly of a male rival with aggression, to the severely swollen belly of a female with courtship. Crude dummies exhibiting these characteristics release the appropriate response. They do so even in males reared from the egg in complete social isolation. The detectors, or ‘innate releasing mechanisms’ (IRM$s$), as they have been called, are ‘phylogenetically tuned’ to these signals (Cullen, 1960).

**Learning dispositions**

Experimentalists have found that the opportunity to threaten or fight a rival can be used as inducement for learning. Fighting fish master a maze if, as a reward, they may threaten a model of a conspecific through a glass pane (Rasa, 1971). Similar results have been obtained with roosters (Thompson, 1963, 1964). Mice learn a task when reinforced by the opportunity to fight another mouse (Tellegen & Horn, 1972). Thus, the acts of fighting and threatening seem to hold some element of pleasure.

**Drive for aggression**

Experiments have shown that animals do not respond to the same releasing stimuli with unvarying intensity. Fluctuations in the readiness to attack are influenced by, among other things, hormonal factors. In many male birds and mammals, the male sex hormone is linked to an increase in aggression at the time of reproduction. Animals thus aroused exhibit so-called appetitive behavior, seeking out releasing stimuli. In some animal species the endogenous fighting impulse or drive is so intense that, in the absence of an appropriate rival, individuals will satisfy their drive on some substitute object.

Social isolates often exhibit something like an urge to fight. The male fighting cocks which Kruijt (1964) raised in complete isolation tried to attack their own tails, and even their shadows, with spurs and beak. They waltzed around madly in their vain attempts. This indicates the existence of inbuilt physiological machinery that urges the animal to attack. The descriptive term ‘drive’ has been applied. It certainly does not imply a unitary mechanism but simply describes the fact of endogenous motivation, which operates in addition to the exogenous factors. In numerous studies, damming-up phenomena and discharge have been demonstrated as a consequence of isolation. Waning of aggressive responsiveness during isolation has also been reported. After heated arguments, it is now accepted that species differences do exist in this respect (literature summarized in Eibl-Eibesfeldt, 1975).

Male cichlid fish (*Etroplus maculatus*) become more aggressive the longer they are kept in isolation. After a certain length of time, females added to the tank are not courted but attacked and killed. But if another male is quickly added, he will be attacked and the female courted. Upon removal of this ‘scapegoat’, the female once again becomes the victim of built-up aggression (Rasa, 1969, 1971). Wickler (1971) has objected that these results are not conclusive, since quite possibly the female, which resembles the male, stimulates and gradually intensifies the male’s preparedness to fight. In his spacious natural surroundings, the male has sufficient opportunity to fight other males. In captivity, however, the female becomes the object of the male’s aggression which she herself has stimulated. This alternative explanation is plausible, and recent findings by Reyer (1975) seem to back such an interpretation. They cannot serve, however, to explain the results of Rasa’s (1971)
experiments with the damselfish (*Microspathodon chrysurus*). The fish learn to swim a
simple L-maze when rewarded in the goal box by sight of a conspecific which they can ‘fight’
through a glass pane. A subject’s length of stay varies with the strength of aggressive drive,
which, in turn, depends on length of isolation. We must emphasize, however, that the
physiology of aggression differs from one species to another and, in fact, even varies within
the group of cichlids.
We do not know the role of central nervous factors in the build-up of fight motivation. They
may play a part in the form of self-arousing neural circuits. But it has already become
possible to release fighting appetite by electrical stimulation of the brain (von Holst & von
Saint-Paul, 1960).
Some critics of the aggressive drive hypothesis claim that rather absurd consequences should
result if there were a spontaneous motivation for aggression, “for example, that an animal
which after many battles has finally secured its territory and has driven off all rivals, will now
go forth like a knight on horseback seeking new enemies” (Schmidbauer, 1972).
Such behavior is certainly not the inevitable consequence of an aggressive drive. A lowering
of threshold need lead to neither a behavior discharge in vacuo nor to abandonment of a
territory. The organism’s system could easily be constructed so that the territorial tie
suppresses any motivation to leave. For species often engaged in fights, it must be
advantageous to experience an increase in aggressive motivation by means of the appropriate
drives. Furthermore, the motivation to attack surely differs from one species to another,
depending on ecological demands. And, lastly, Wickler (1971) has rightly pointed out that
aggression probably evolved repeatedly and independently in various animal groups, just like
the wings of birds, bats, and insects.
Our next concern is this not uncommon query: just how ‘useful’, in a biological sense, is such
a spontaneous aggression drive? Would it not have been more expedient to develop a reactive
mechanism for aggression? Possibly, although not certainly, this would be so. But how simple
is the construction of such a mechanism? The building blocks of the system in question, as we
have seen, are spontaneously active neurons. Perhaps it is a characteristic of neural
construction that complex systems so frequently display spontaneity. Even the escape
behavior in many birds and mammals seems subject to an ‘escape drive’, or ‘flight instinct’,
although such a drive would at first glance seem rather pointless.
Eibl-Eibesfeldt claims the existence of phylogenetic adaptations in the realm of human
aggressive behavior. For instance, a number of motor patterns of aggression are universals.
Furthermore, fear and mistrust of strangers develops in children between 6 and 8 months of
age, evidently according to an inherited program.
Proponents of the secondary drive hypothesis hold that aggression cannot claim its own
primary drive but, instead, serves other primary drives, which it helps to gratify. According to
this theory, aggression is aroused only by the suppression of other drives. In other words, if
these primary drives were completely satisfied, there would be no aggression. Thus, Plack
(1968) attributes all aggression to suppression of the sex drive.
The same basic premise is contained in the frustration-aggression hypothesis of Dollard et al.
(1939). These researchers proposed that every privation, defined as the obstruction of a
goal-directed behavior, results in aggressivity – especially those frustrations experienced in
early childhood.
Again, this means that aggression should be viewed merely as a vehicle designed to serve
other motivations, i.e., there is no separate aggression drive. Aggressive motivation is further
viewed as secondary by proponents of the social-learning hypothesis – the view that
aggressive behavior is learned from social models. Kunz (1946) went so far as to say that
aggression is a “degeneration of the organism’s natural activity”, i.e., a pathological
condition.
Eibl-Eibesfeldt (1977) quite agrees that, as yet, there is no actual proof of an innate aggressive drive in man. Neither do claims to the contrary, however (e.g., Rattner, 1970), rest on any better an empirical foundation. We remain largely dependent upon circumstantial evidence. Here, in Eibl-Eibesfeldt’s opinion, the scales are tipped in favor of an innate drive for aggression. A strong indication is the fact that some manifestations of aggression can be observed even in basically peaceful societies. Next, a close look at the onto-genesis of social behavior reveals that aggressive behavior first develops in every individual, and secondarily is socialized. One may well object that no culture provides for a childhood completely devoid of frustrating experiences. If we define the concept of frustration broadly enough, this proves to be true. Still, this does not constitute proof that experiences of frustration are the sole cause of aggressive behavior.

A further argument against the aggressive drive hypothesis is that a child is reinforced for aggression when such behavior, in the form of demands for food, nurture, and so on, frequently leads to success. Again, this is a valid objection, but it still does not exclude the possibility of a primary drive for aggression (Eibl-Eibesfeldt, 1977).

Appetence for aggression... or optimal arousal?

Van der Molen (1980) holds that in every case investigated, such appetence for aggressive behavior could equally well be labeled as appetence for a certain other functional pattern like e.g. territorial behavior and/or as attempts of the individual to maintain an optimum level of arousal.

“...Excitement and kinetic activity are shown to be dependent on the external stimulus state of the animal, decreasing under conditions of low mean environmental stimulation. These findings indicate that an animal attempts to regulate its internal stimulus state by behavioral means when the component variables of this state have been disturbed by abnormal environmental conditions” (Rasa, 1971). So the point seems to be that in preparing an animal for such an experiment, i.e. by depriving it from opportunities to exercise aggressive behavior, the animal is simultaneously deprived of optimum arousal levels, and a short raise in arousal – whatever its context – will consequently work rewarding.

Sevenster (1973; pers. comm. in Van der Molen, 1980) arrived at a similar conclusion in his experiments with sticklebacks. He evaluated his results on the rewarding effect of opportunities to interact aggressively. He investigated the rewarding properties of each component of the situation of agonistic interaction in question separately, and concluded that it is the element of environmental change which in particular works rewarding for the (somewhat arousal-deprived) male sticklebacks but only so if the change in question induces no flight behavior.

Parallel to these findings are the experimental results as those of Kavenau (1967), who showed poignantly how mice, being forced to respond in stereotype experimental situations, will give ‘incorrect’ responses as a means of introducing variability. Variability, which may easily be interpreted as error by the conductor of the conditioning experiments in question, but which may be a quite adaptive response in terms of maintaining optimum levels of arousal in the animal.

And the comments of Lorenz, (one of) the greatest former promotor(s) of the aggressive-drive theory and the idea of aggression-specific energy, on Rasa’s experiments, is illustrative:

“...So my own comment to Anne Rasa’s irrefutable demonstration of general excitation as an independent parameter determining all animal and human behavior is necessarily the same
which Thomas Huxley is reliably reported to have made when he first read Darwin’s origin of species: “How stupid of me not to have thought of that!” (Lorenz, in: Rasa, 1971).

Specific appetite for aggressive behavior may therefore not exist at all in ordinary natural settings in which plenty opportunity is available for attaining proper arousal levels. This is suggested for instance by Goodall’s (1971) descriptions of the occurrence of aggressive encounters in the daily life of free-living chimpanzees. The frequency of intraspecific aggressive behavior varies strongly for every individual and for the whole group in question and is highest whenever hierarchical relations have become unclear. The readiness to show intraspecific aggressive behavior does not seem to depend at all on the period of time that has elapsed since the last agonistic confrontation, but rather on circumstances which make it difficult to avoid the application of aggression.

The existence of a drive for aggression, irrespective of a functional context, would in fact be highly improbable from a game-theoretical point of view. An individual runs heavy risks every time he engages in aggressive encounters. Therefore it seems good strategy to reserve aggressive behavior for situations in which the risk for damage is sufficiently counterbalanced by a possible raise of the chances for survival and/or propagation of the specific genetic information in question, after successful agonistic action. Translated to the level of ethological theory, this means that aggressive behavior is unlikely to be organized in other ways than merely as a subsidiary instinct, as an instrument – which may sometimes be indispensable – for achieving certain goals which bear survival value for the individual(s genes) in question. Drives then, should be sought on the level of these principal goals and not on the instrumental level (Van der Molen, 1980).

From all these considerations we may conclude that for understanding function and (long-term) causation of aggressive behavior it is apparently of great importance to include phenomena like ‘boredom’, ‘excitement-seeking’ and ‘anxiety’ in our considerations. Instead we should keep in mind the instrumental aspects of aggressive behavior and also avoid focussing merely on concepts like aggressive drive and aggression-specific energy as fit a psychohydraulic model.

**Emergency behavior**

Van Rooijen (1975) reviews models on ‘escape’- and ‘emergency’-reactions as derived from current ethological and psychological research. In his study he describes a general ‘emergency-system’ which prepares individuals for responding adequately in cases of emergency, and he labels it as ‘Behavioral System for the Anticipation of Damage’ (Compare for instance the ‘Flight/Fight Response’ of Cannon (1932); or the ‘activation of the parasympathetic versus the sympathetic part of the autonomic nervous system’ (e.g. Russell, 1975); and Selye’s (1956, 1971) ‘Non-specific response’).

An essential of Van Rooijen’s model is the application of a strategy of ‘flexible response’. The more an individual is threatened, the stronger his ‘Anticipation of Damage System’ is activated. The level of activation of this emergency system determines which types of behavior may be expected, and the following modes of reaction may roughly be discerned. First, alertness is heightened and attention is directed towards the relevant stimuli, whereas the information processing capacity is probably enlarged. The autonomic arousal during this pre-mobile phase of reaction may also be inferred from external emotional reactions. Digestion is suppressed and overt behavior in general is also reduced initially. The next mode of reaction is autonomic arousal which prepares for overt action. Defecation and urination may occur in this phase.
Finally, overt activity occurs, generally expressed in ‘escape’ in the cases which van Rooijen considers. Other modifications of this ‘overt activity’ phase are also possible and (defensive) attack may be considered as one of these possible reflexes. Whatever the reaction in this last stage of alarm, its function is to reduce the alarming stimuli and the level of arousal. Referring to Fig. 1, this stage of emergency reactions is represented by the folded part of the graph, including the catastrophic behavioral changes attack and flight. When overt attack- or escape-behavior are blocked for one reason or other, a further activation of the emergency system may induce complete and extreme immobility (‘black-out’).

As van Rooijen points out, learned reflexes may enhance, reduce or alter the behavioral expressions of the emergency system on their various levels. An individual learns by experience which responses serve best to attain a desired (low) activation state of this emergency system. ‘Carefulness’ may for instance be considered as an optimal integration of already received information, subsequent (partial) reduction of overt behavior and raised alertness. Individuals may ‘learn’ which situations are met best with a careful approach and which situations with instantaneous flight or attack. Van Rooijen suggests that the learning processes themselves are probably enhanced most by a moderate activation level of the emergency system. Considerable information uptake- and processing-capacity is required for learning, whereas in the most extreme emergency-reaction-modes like e.g. panicky flight, the full neural processing capacity is probably reserved for ad-hoc problems.
When the ‘Anticipation of Damage Behavioral System’ is activated too strongly and too continuously, pathogenic effects emerge like neuroses, phobias, psycho-somatoses, and even physical disorders (Blythe, 1973). These pathological traits in their turn enhance, through inadequately rigid responses in a varying environment, strong stimulation of the emergency system. Thus vicious spirals of ever increasing pathogenic effects are likely to occur as long as an individual does not adequately succeed in reducing the alarming stimuli and the resulting level of arousal.

Agonistic behaviors may be fitted into van Rooijen’s model in two ways. On the one hand flight and attack may be final – suddenly and catastrophically occurring – reflexes during a high activation of the emergency system. On the other hand, flight and in particular attack, may be learned and rather optional responses to specific familiar emergency situations. In the latter case flight and attack may occur at a lower activation level of the emergency system already and may subsequently change into each other more gradually (Van der Molen, 1980). Kortmulder’s (1974) hypothesis of ‘Behavioral Expansion’ runs to some extent parallel to van Rooijen’s ideas. To the classical postulate of antagonistic ‘attack’- and ‘escape’-tendencies, Kortmulder adds the antagonism between ‘centrifugal’- and ‘centripetal’-tendencies.

Full-scale attack and flight are considered as centripetal behaviors whereas courtship and in particular playful (agonistic) interaction are considered as more centrifugal types of behavior. The words centripetal and centrifugal refer to the tendency of expanding the (interactive) behavioral activities, respectively to the tendency of reducing and simplifying the (interactive) behavioral situation. Strong activation of the ‘emergency system’ (van Rooijen) corresponds with ‘centripetal tendencies’ (Kortmulder), and a weak activation of the ‘emergency system’ corresponds with ‘centrifugal tendencies’ of behavioral expansion.

When exploring the environment or when playfully interacting with a partner, an individual is supposed to be in a process of behavioral expansion’ (‘centrifugal’ behavioral forces). But when the situation becomes dangerous – for instance when a partner suddenly play-attacks too frighteningly hard – the ‘Anticipation of Damage System’ (van Rooijen) is activated and an increased ‘centripetal’ (Kortmulder) tendency leads to reduction of the behavioral setting through flight or attack. According to Kortmulder, individuals strive after being in a state of behavioral expansion as often as possible. Through that behavioral state their behavioral repertoire expands and their skill in dealing with the animate and inanimate environment increases. This is similar to van Rooijen’s notion that learning processes are blocked by a too high and too continuous activation of the emergency system. Parallel to Maslow’s (1968) behavioral models of primates and men, Kortmulder (1972, 1974) discerns between:

- animals with a behavioral repertoire which is fully actualized through sufficient periods of behavioral expansion, and

- animals who have stayed under the influence of centripetal behavioral forces too often and too continuously and who subsequently show a reduced and highly stereotyped behavioral repertoire.

“...Whereas self-actualizing fishes typically swim around actively also outside reproductive periods, or feed, inferior fishes often stand still for long periods of time, even in the absence of the dominant male. If they move, locomotion is typically wavering and slow. They often do not feed at all. The typical comfort movements of self-actualizing fishes are yawning-stretching, stretching, fin-flickering and chafing. In inferior fishes all comfort movements involving rump musculature often are absent. They typically show headshaking
and mouthflickering. When performing yawn-stretch, only the mouth is opened and closed; the concurrent contraction of body musculature and the raising of the fins are often very weak or absent. The general behavior of such inferior fishes is somewhat similar to the behavior of a sick fish. This is so even in the absence of any visible trace of bodily damage. The above observations suggest that the switch from self-actualizing to inferior behavior marks the onset of a profound physiological change which is easily reversible when short-lasting but which tends towards irreversibility when submission is prolonged” (Kortmulder, 1972).

Taking the models of Kortmulder and van Rooijen into account, we can explain not only the gradual and the sudden changes from flight to escape and vice versa, but also the gradual and the sudden changes from play to full-scale agonistic interaction. Thus we may integrate in one model the two different modes of aggressive interaction, viz. the ‘rough-and-tumble’ and the ‘reactive fighting’ as may be discerned in many species (Harlow, 1965, on rhesus monkeys; Blurton-Jones, 1967, and Hamburg, 1971, on human children; Goodall, 1971, on free-living chimpanzees). As far as these aggressive behaviors are concerned, we may represent the two concepts of behavioral antagonism graphically in one figure by means of the mathematical models of ‘butterfly catastrophes’ (Zeeman, 1975). Butterfly catastrophes describe tristable systems, like e.g. three behavioral modes which can shade off into one another, but which may, under certain conditions, also turn into each other in a sudden and catastrophic way. Fig. 2 depicts that an increase of danger and provocations induces agonistic behavior, which is expressed as attack or escape, depending on the equilibrium between fear and anger. When centripetal forces do not reach extreme values however, playful interaction is also possible, depending on the equilibrium between anger and fear and depending on the previous emotional state. Play is possible in the motivational space indicated by ‘pocket’, ||| and ::: in the bottom-sheet of Fig. 2. The dotted area indicates three possible behavioral modes. Horizontal lines indicate bistability between play and other behavior. Catastrophic changes in behavior may occur in half of the motivational states that are indicated by the lines on the bottom projection, depending on the previous state of motivation.
One of the parameters of this graph is the so-called ‘butterfly-factor’ which determines the size of the pocket in the bifurcation-set. A bigger pocket represents a greater probability of playful behavior. The ‘butterfly-factor’ might therefore be used to indicate an individual’s skill in dealing with ambivalent motivational situations without having to resort to full-scale attack or flight. In other words: by an increasing butterfly-factor we may graphically represent the long-term effect of adequate frequencies of behavioral expansion, namely the raise in skills which results from the centrifugal behavioral activities of play and exploration. A raise in skills causes in its turn a lower necessity to resort to centripetal behavior and thus a lower probability of purely agonistic behavior and subsequently a further increased probability of playful and explorative behavior.

This positive feed-back mechanism in learning represents the opposite of the vicious spirals of ever increasing pathogenic effects described earlier. Of course it is also possible to block the positive ‘learning’-spiral by denying the individual any reasonable amount of experience, for instance by isolation. Centrifugal moods then simply cannot result in drifting into relevant experiences through lack of environmental possibilities. Individuals which have been isolated during long and crucial periods of their lives, generally show inadequacy of reactions to a high degree (see e.g. Kruijt, 1964, on jungle fowl; Peijs, 1977, on rats, van der Molen, 1980, on mice; van der Dennen, 1975, for a general review). As Kortmulder (1974) points out, courtship may be compared to play in that courtship partners ‘learn’ to get behaviorally adjusted to, and synchronized with each other and thus ‘learn’ to avoid full-scale agonistic behavior towards one another. In the course of the courting process centripetal tendencies gradually give way to centrifugal tendencies until mutual aggression has almost disappeared.
and the animals have learned to ‘know’ each other in playful interaction. Therefore Zeeman’s
graphical representation might *mutatis mutandis* be used equally well to describe the
interactions between sexual-, approach-, withdrawal-, attack- and escape-tendencies in
courtship and the learning processes involved (V’an der Molen, 1980).

**Reversal theory**

Kortmulder’s hypothesis of ‘Behavioral Expansion’ was derived from animal behavior. A
somewhat akin model was derived from studies on human behavior by Smith & Apter (1975;

Kortmulder’s antagonist ‘centripetal’- and ‘centrifugal’-tendencies can be found in Smith &
Apter’s model as ‘telic’ (goal-directed) and ‘paratelic’ (behavior-directed) tendencies. Apter
& Smith (1979) explain:

“... we shall simply start by stating one of the fundamental postulates of the theory. This is
that certain psychological processes, especially certain motivational and emotional processes,
exhibit bistability rather than homeostasis (i.e. unistability). Switching from one stable state
to the other in a bistable system can be referred to as a ‘reversal’ (hence the name of the
theory) and may be brought about by a number of different factors.

For example, it is argued that at certain times the individual seeks high arousal which is then
felt as pleasant when achieved (‘excitement’); at other times he reverses to a state in which he
seeks low arousal, at which time high arousal is felt as unpleasant (‘anxiety’). In the former
case low arousal is felt as unpleasant (‘boredom’) and in the latter case low arousal is felt as
pleasant (‘relaxation’). This is summarized in the two hypothetical curves drawn in the
accompanying diagram (Fig. 3), each curve representing the relationship between arousal and
affective tone for each of these stable states. These two states are labelled ‘telic’ and
‘paratelic’ respectively. This view of the relationship between felt arousal and affective tone
contrasts sharply with that of optimal arousal theory which is a homeostatic theory, although
the typical inverted U-curve (shown dotted in Fig. 1) postulated by optimal arousal theory,
can be seen as a special case of the X-curve suggested by reversal theory”.

![Diagram of Reversal Theory](image-url)
On explorative behavior and the familiarity-novelty opposition Smith & Apter (1975) write:

“In the telic system, familiarity is the dominant member of the pair and novelty is the dominant member in the paratelic system. That is to say, in the telic system the organism searches for security and safety in order to reduce arousal; in the paratelic system it searches for novelty and surprise in order to increase arousal. The latter is what is normally referred to as exploration. However, calling exploration a drive as is now done widely, following the work of Butler (1953), Berlyne (1960) and others, implies that to discover new things is arousal reducing. Our claim is the contrary: namely that such discovery increases arousal and, in the paratelic mode, this is in fact pleasurable. This idea therefore constitutes an attack on the assumption that all behavior is governed by principles of drive-reduction”

They also stress that proper alternations of all the pairs of antagonist tendencies seems to be crucial for functioning well. However, opposition pairs may sometimes occur together instead of alternating in time. This phenomenon is called ‘synergy’. It is achieved by treating different aspects of the situation in opposing ways simultaneously (e.g. the context of some situation may elicit feelings of security, the content feelings of novelty). Synergies have an effect of amplifying emotional effects. Therefore synergies prevail in paratelic motivational contexts in which a high level of arousal is sought.

According to Apter & Smith (1975, 1976bc) the paratelic state is especially important for learning processes: “As defined earlier, the paratelic system is concerned with expressing behavior rather than goals and is perhaps seen in its purest state in children playing. It presumably arose because it had survival value in the young in allowing behavior to be exercised. In humans such play in the adult may be an example of neoteny which has turned out to be biologically advantageous” (Smith & Apter, 1975).

Apter & Smith’s hypotheses on ‘Psychological Reversals’ provide a theoretical framework which connects learning processes with alternating antagonist motivational states in the same way as Kortmulder’s hypothesis on ‘Behavioral Expansion’. As in the theory of Behavioral Expansion, agonistic behaviors can be fitted very well into the theory of Psychological Reversals. Full-scale attack and flight are typically telic strategies in that they are of a strongly reactive nature, aimed at the achievement of a certain goal (subjection or expulsion of a competitor respectively escaping from a danger), and aimed at the reduction of the arousal level and re-stabilization of the status quo. Play-fight and social exploration are on the other hand typically paratelic strategies in that they are of a spontaneous non-reactive nature, aimed at raising the level of arousal.

Based on the above hypotheses, Van der Molen (1980) discerns two learning spirals, both of which result from positive feed-back loops.

One spiral contains improper alternations of telic and paratelic states and results in ever more rigid and stereotyped behavior such as for instance either immediate full-scale flight or indiscriminate attack in agonistic situations, without options for intermediate responses and subtle alternations. The other spiral contains proper alternations of telic and paratelic states and results in an ever growing diversity of adaptational responses (skills).

**Geist (1978) on Aggression**

According to Zipf’s Law, “individuals ought to minimize expenditures on maintenance in order to maximize reproductive fitness, thereby sparing maximum resources for reproduction...”. A corollary of Zipf’s Law is that “the simpler the signal, the less costly it is of energy, the more frequently it will be used ...(and hence) behavior patterns very costly of
energy, such as clashing, butting etc., tend to be used less than their corresponding threat patterns, which are in turn less frequently used than the simpler patterns such as the horn displays”.

In classical ethological terms, stimulus contrast evokes changes in animal behavior because it “bodes no good and it is (therefore) adaptive (for the animal) to respond with arousal, that is, to be prepared for the eventuality of flight (etc.)”. This is because ‘signals come to the attention (of an animal) by rising above the common sounds, motions, and postures simply by being relatively rare, and novelty...creates arousal”. Hence it is common to observe “overt hostility triggered against individuals that act ‘abnormally’ – and among humans just as among animals generally. Likewise, “Under kin selection, displays enhancing overt aggression would be common, since demes fight demes as groups”. Geist defines “aggression as social behavior that displaces individuals and/or bars their access to scarce resources, as well as those actions that protect the individual from bodily harm. This... makes (aggression) part of agonistic behavior”. But “the study of aggression in primates will tell us very little about human aggression; in fact, aggression as practiced in carnivores and in ungulates teaches us considerably more”. This is because “familiarity with groups of species in which overt aggression is damaging and rare, such as rodents or primates, may lead to a different understanding of overt aggression than would a familiarity with ungulate species in which excellent morphological and behavioral defences protect the fighters”. Recent studies “of large mammals... have shown clearly that death through intraspecific combat is by no means rare, and that injury during such combat is reduced less by inhibitions against using weapons than by skillful uses of defence strategies, behaviors, and morphological adaptations”. But “Only humans, by virtue of cultural weapons and defences, can escape prompt retaliation either by killing the opponent outright or, if not by killing outright, by ducking behind some protective shield... Only the instant death of the victim, or its inability to retaliate, or some means of escaping retaliation, will permit damaging aggression to flourish” in human societies.

“Since sexual behavior can normally only be performed after successful competition against conspecifics of equal or near-equal status... it appears logical that an individual prepared to copulate must also be prepared to do combat. Thus neural mechanisms controlling sexual and agonistic behavior may have to be equally susceptible to any given level of arousal”.

**Evolutionary psychology and aggression**

From the perspective of evolutionary psychology, aggression is not a singular or unitary phenomenon. Rather, it represents a collection of strategies that are manifest under highly specific contextual conditions. The mechanisms underlying aggression have emerged, on this account, as solutions, albeit repugnant ones, to a host of distinct adaptive problems, such as resource procurement, intrasexual competition, hierarchy negotiation, and mate retention. From this perspective, variability in aggression – between the sexes, across individuals, over the lifespan, and across cultures – is predicted theoretically (Buss & Shackelford, 1997: 617; see also Daly & Wilson, 1988; A. Campbell, 1995 et seq.). This contrasts markedly from earlier instinct theories, in which aggression was presumed to be manifest invariantly, ‘pushed out’ in all people one way or another. An example of such a (male reproductive) strategy is sexual coercion. Sexual coercion looks also to be the underlying reason of male battering of female chimpanzees, because the mating patterns in Gombe demonstrate how particularly effective male domination is. As Goodall (1986) describes it: “Almost always, unless he is crippled or very old, an adult male can coerce an unwilling female into copulating with him”. So the rule
seems to be: Coercion works. Furthermore, Goodall states: “Males may attack females seemingly in order to drum into their victims, again and again, that theirs is a male-dominated society”.

Zillman’s Evaluation of the Ethological and Evolutionary Theories

Phylogenetic speculation has led Lorenz (1963, 1964, 1965) to propose that aggression in man is both instinctive and spontaneous: “There cannot be any doubt, in the opinion of any biologically-minded scientist, that intraspecific aggression is, in Man, just as much of a spontaneous instinctive drive as in most other higher vertebrates” (1964). Lorenz arrived at this sweeping proposal mainly by reviewing findings on conspecific aggression in birds and fish. There is some evidence that in these animals, particularly in fish (cf. Tinbergen, 1968), this type of aggression is not learned but is instinctive. Cullen (1961) showed that male sticklebacks that were reared from the egg in isolation from other animals displayed the complete and appropriate fighting behavior of males reared under normal conditions. Similarly, Eibl-Eibesfeldt (1963a,b) reported that grey Norway rats that were reared in isolation displayed normal threat and fighting behavior. With instinctive conspecific aggression in lower vertebrates thus in evidence, Lorenz proceeded to proclaim aggression to be instinctive for all higher vertebrates as well. Although he acknowledged, at times (e.g. 1965), the more highly developed organism’s capacity to learn to respond to environmental settings related to aggression, he totally disregarded the potential biological significance of this capacity, particularly in the context of conspecific aggression. Lorenz made it very clear that in his view, aggression in higher vertebrates, in the primates, and finally, in man is not acquired in response to particular environmental conditions but is built into the organism. He posited that: “Man has inherited instincts, too; and the instinct to aggress is not a reactive one, but is a spontaneous activity within ourselves” (1965)

With the propensity for aggression thus built into the organism, the role of the environment, in Lorenz’s view, is to provide key stimuli that elicit fighting and to furnish other highly specific displays that stop it. As might be expected, the organism’s sensitivity to such releasers and counterreleasers is conceived of as innate. Releasers are said to fit the innate releasing mechanisms as keys fit locks. As a consequence, the function of such stimuli in triggering or stopping intraspecific fighting is considered rigid and practically unmodifiable by learning (Zillmann, 1979).

The existence of releaser mechanisms in lower vertebrates is not in doubt. One of the major contributions of ethology has been the delineation of such mechanisms. Ethologists have specified stimulus configurations that elicit so-called fixed actions patterns – that is, relatively invariant characteristic behavior sequences (cf. Eibl-Eibesfeldt, 1970; Marler & Hamilton, 1968; Tinbergen, 1951). In the context of conspecific fighting, the function of releasing stimuli has been abundantly documented for a great variety of species. For example, it has been shown that in fence lizards, the male attacks models of its kind only if they display the male’s blue throat (Noble & Bradley, 1933) and that male sticklebacks attack only models that show the red belly of the male in breeding condition (ter Pelkewijk & Tinbergen, 1937). Similarly, it was observed that when the female of a pair of American flickers was provided with an artificial mustache (the unobtrusive distinguishing characteristic of the male), she was attacked by her own mate until the mustache was removed (Noble, 1936). Similarly, changing the color of the chest of the female chaffinch from grey-brown to the male’s orange-brown resulted in attacks from males in close proximity (Marler, 1956). Such findings have been employed to demonstrate the overriding importance of innate response mechanisms in the elicitation of aggressive behavior in general. The proposed innateness of these mechanisms
has remained a controversial issue, however, because in the judgment of many biologists (cf. Lehman, 1953, 1970; Schneirla, 1959), the involvement of learning in the ontogenesis of seemingly instinct-controlled behaviors has not been ruled out decisively. The rigidity or stability of the releasing mechanisms has also been challenged, since the perceptual systems involved have been found to change considerably in the process of ontogeny (Hailman, 1970).

Evidence demonstrating characteristic displays that serve the inhibition or the cessation of fighting is less abundant. In fact, there is no systematically produced evidence of the function of such displays (Zillmann, 1979). Instead, Lorenz has contributed some informal observations. He reported (1953) that in young rails, the back of the head is equipped with a naked spot that shows a skin area of high blood concentration. Presentation of this spot to adult rails, he suggested, inhibits attack. The presentation of ‘blood spots’ is not claimed to function as a universal inhibitor, however. It is pointed out that in cranes, for example, the display of such spots serves as an aggression releaser. Lorenz believes that he has detected inhibiting stimuli not so much in relatively stable, long-lasting stimulus configurations but in transient characteristics of behavior – more specifically, in behavioral changes during fighting. Encounters between fish, for example, may result in fighting when the animals involved display their colors, move in a conspicuous, abrupt manner, or present themselves as large as possible. The fight, he suggested, can be discontinued at any time by the removal of these releasers – that is, by a participant’s turning pale, remaining relatively motionless, or positioning himself so as to appear small. A further illustration of the cessation of fighting through the removal of releasers is given in the case of a defeated fighting rooster that seemed to attempt to hide its comb, the presumed releaser, in order to discontinue the elicitation of its opponent’s attack.

Lorenz’s most spectacular and most frequently cited illustration of a counterreleaser, the exposure of the jugular vein in a defeated wolf or dog to stop the attack of the victorious opponent, has been faulted. What Lorenz considered an aggression-ceasing submission display that renders the animal extremely vulnerable to potentially fatal injury was found to be a challenging posture that characteristically leads to further attack and fighting (Schenkel, 1967). Considering acceptable evidence, the claim of counterreleasers – that is, of bodily features or innate behavioral displays that cause the discontinuation of fighting through innate releasing mechanisms – is in no way supported (cf. Barnett, 1967).

Generally speaking, conspecific fighting seems to be discontinued not so much because of the display of highly specific behaviors that signal surrender and defeat but simply because one of the antagonists withdraws or displays relatively nonspecific signs of submission, thereby removing any aggression-promoting releasers (Zillmann, 1979). The lack of evidence for universal releasers in man and other higher vertebrates, damaging as it may seem to the analogy between the function of innate releasers in lower and higher animals, has done little to deter Lorenz from proclaiming aggression as instinctive in man. This is because of the concept of ritualized aggression, which plays a crucial role in the instinct claim. Lorenz (e.g. 1942, 1963, 1964) proposed that in order to curb aggressive behavior that produces dysfunctional, nonadaptive consequences for a species, nondestructive, pseudo-aggressive forms of behavior evolved and came to serve the purpose of the more archaic destructive behavior. The concept of ritualization was introduced mainly to accommodate the conspicuous fact that in much conspecific fighting the antagonists rarely injure each other. In Lorenz’s view, nondestructive conspecific fighting is genuine aggression, because the animals involved draw upon a repertoire of aggressive action patterns that greatly overlaps with that of the action patterns of destructive aggression – at least at the outset of the ritualization process. However, in conspecific fighting over territory, social rank, mates, and the like, the antagonistic animals are seen to operate under ‘innately known’
constraints so as not to inflict damage upon one another. The fight for first rights is thus seen as ritualistic rather than real. Bruising as it may be, such fighting is viewed as constituting tournaments rather than battles with potentially fatal consequences. The documentation of ritualistic or tournamental righting is extensive (e.g. Eibl-Eibeafeldt, 1963, 1970; Lorenz, 1963, 1964). It ranges from the ceremonial combat of lizards – who take turns grasping each other’s necks until one party seems exhausted (Kitzler, 1942) – to gazelles’ snout-pushing maneuvers – which are said to have evolved from biting (Walther, 1958). The more spectacular illustrations come from species equipped to kill or mutilate with ease. Rattlesnakes, for example, do not bite each other but determine conspecific dominance in elaborate wrestling matches (Shaw, 1948). Oryx antelopes, who use their spear-like horns to stab predators, do not use these weapons in their conspecific head-to-head pushing contests (Walther, 1958).

The impression these examples create – that ritualized surrogates for destructive conspecific fighting have evolved in all species – is erroneous, however. In many species, if conditions prevent the separation of the antagonistic parties – that is, if the endangered animal fails to escape – fighting continues until mutilation or death. For example, lions have been observed to kill lions of other prides (Schaller, 1969; Schenkel, 1966) and African wildebeests have been witnessed using their horns against their rivals, putting their eyes out and otherwise injuring them severely (Estes, 1969). Among numerous other species – such as cichlid fish, hamsters, langurs, baboons, and gorillas – if the flight of the subordinate animal is unsuccessful, the victorious animal is likely to fight to the point of the opponent’s physical incapacitation or death (Dart, 1961; Eibl-Eibesfeldt, 1970; Hall, 1966; Goodall, 1968; Sugiyama, 1967; Yoshiya, 1968). (See for an elaboration of the ‘lethality of animal fighting’ issue, the file ‘Problems’).

The apparent harmlessness of conspecific fighting is often not so much the result of the seemingly marvelous evolution of nondestructive substitute behaviors as it is the consequence of speedy flight on the part of the defeated animal and the limited capacity of the victorious one to inflict injury upon a conspecific. The latter is partly dependent on an injury-resistant anatomy – on sturdy skulls and thick hides (Cf. Johnson, 1972).

Notwithstanding such ‘primitive’ resolutions of the injury problem in conspecific fighting, it is generally accepted that conspecific skirmishes typically are settled without serious physical injury to the participants (cf. Hinde, 1970). The evolution of obviously adaptive, nondestructive conspecific fighting for various purposes is thus not in question. Rather, the issue in controversy is the way in which such fighting is said to have evolved and into what behavioral forms it is considered to have evolved. Lorenz (1963) and his followers (e.g. Eibl-Eibesfeldt, 1970) apparently have assumed that the destructive forces of instinctive aggression were initially directed indiscriminately both at members of other species and at conspecifics. The contention, then, is that to assure survival of a species, destructive aggression against conspecifics has been redirected and channeled into less destructive forms – such as ritualized fighting – for determining conflict-resolving dominance. In terms of specific behaviors, for example, biting has evolved into snout pushing in gazelles, and striking and biting into wrestling in rattlesnakes. However, in liberal extensions of the notion of ritualized aggression, the evolution of redirected behavior is not confined to the removal of destructive elements from fighting. Behaviors that do not involve physical contact or that do not bring harm or even disadvantage to opponents – such as territory-marking bird songs (cf. Marler & Hamilton, 1968) – are also conceived of as ritualized aggression. The full scope of forms of redirected aggression becomes most apparent in the discussion of human aggression (e.g. Eibl-Eibesfeldt, 1971; Lorenz, 1963; Storr, 1968). The desire to perform a task better than others, to achieve success professionally or in private life, or simply to come out a winner in competition involving skill or chance is seen to derive directly from instinctive
aggression. Similarly, a person’s willingness to defend his personal values or those endorsed by the culture into which he finds himself born is also considered to have evolved and to be inherited (Lorenz, 1963, 1965). And last but not least, even bonding behavior in man – that is, love – is said to have evolved by way of ritualization on the basis of aggressive instinct (Lorenz, 1964). Thus, it should be clear that at the very least, all competitive, self-assertive behaviors in man are pronounced aggressive activities, and all are presumed to have evolved from a primal force of instinctive aggression. Put somewhat more dramatically, aggression is seen as the force of life itself (Zillmann, 1979).

Lorenz’s grand theory proves wanting on several counts. There are serious conceptual ambiguities in the principal propositions, and the far-reaching projection from invertebrates and lower vertebrates onto higher vertebrates seems entirely unwarranted and unjustifiable. First, the implicit assumption of initially indiscriminate aggression is highly questionable. It is difficult to imagine how any species could have survived such an archaic state of conspecific fighting. More importantly, however, the concept of evolution has been applied quite arbitrarily and selectively. Whereas aggressive behaviors were apparently free to evolve into any ritual form, seemingly without constraints, the motivational forces behind them were treated as immutable. Whereas in any given species, nonadaptive conspecific aggression is considered to have fallen by the wayside in the process of evolutionary advancement, conspecific destructive urges are still presumed to be alive and active. Bigelow (1972) has considered such reasoning an inversion of the concept of evolution: “Because we have evolved from lower animals, our ‘animal’ responses have not evolved”. Considering the needed empirical evidence, a universal instinctive aggressive force has of course never been shown to exist in any organism (cf. e.g. Bandura, 1973; Hinde, 1970; Scott, 1969). The fact that specific aggressive behaviors have been shown to be independent of social learning, as reported earlier, is irrelevant here. These behaviors merely demonstrate that animals, such as fish and birds, are equipped with the neural and humoral apparatuses for particular fixed action patterns and that these action patterns can be elicited by appropriate stimuli. They do not support the claim that animals are generally endowed with instinctive forces that motivate aggression (e.g. Eibl-Eibesfeldt, 1970). (In this connection, the acknowledgment that proof of such an inborn aggressive drive in man has not yet been presented [also Eibl-Eibesfeldt, 1970] is reassuring).

To establish a universal force, the needed, crucial evidence concerns the hypothesized conversion or transformation of motivational energy from aggressive to pseudoaggressive and finally nonaggressive energy. Has it ever be demonstrated that a person who seeks high accomplishment or simply tries to show himself in a favorable light is spurred by inherited, initially destructive forces? Or in considering the smallest conceivable redirection, has it ever been shown that snout pushing to determine social rank in animals derives from injurious biting used in pursuit of the same objective? Very plainly, there is no acceptable supportive evidence. The claim of the evolutionary redirection of presumed instinctive aggression rests solely on intuitive judgment. The illustrations employed to make such judgments convincing – specifically, the unsystematic eclectic comparison of similar, related species, which shows incidents of nondestructive conspecific fighting in the seemingly more advanced species – are at best suggestive of evolutionary changes toward ritualization (Zillmann, 1979).

In these illustrations, species are compared that characteristically differ according to a variety of behavioral criteria, and the presumed initial identity regarding aggression mechanisms is, for obvious reasons, merely assumed and never documented. Under such circumstances, compelling demonstrations of behavioral homology are inconceivable (cf. Atz, 1970). But no matter how suggestive the type of illustration discussed may be, there are no grounds for believing that as nondestructive forms of fighting evolved, the associated motivational forces remained unchanged. In fact, there is little reason to believe that prior to the presumed
evolutionary separation of overt forms of aggressive behavior, these behaviors were governed by identical or highly similar mechanisms (cf. Lehrman, 1970).

The notion of redirected instinctive energy not only is empirically unfounded; it leads to a conceptual dilemma as well. If Lorenz’s (1963, 1964) contention that socially constructive behaviors – bonding behavior and caretaking in particular – have likewise evolved on the basis of an aggression instinct is taken seriously (and it apparently is not by most of his critics), the totalistic, all-encompassing scheme of instinctive aggression becomes obvious. It is unclear how any phylogenetic classification could possibly prevent anybody from arbitrarily pronouncing aggression to be the force behind any and every behavior. If supportive evidence for the proposals made were not required, all nonaggressive behaviors – by virtue of their existence – could be declared to have evolved from instinctive aggression by virtue of the presumption of such a universal basis. The notion of ritualization is thus a patent formula that, although in actuality explaining nothing, seems to make matters plausible to those who are the least critical (Zillmann, 1979).

A final comment concerning Lorenz’s propositions is in order. Lorenz (e.g. 1942, 1961) suggested that the force energizing any instinctive behavior – aggressive behavior being a case in point – is cumulative. Specifically, he posited that if the energy assumed to be associated with specific aggressive behaviors is not regularly discharged in appropriate actions, it accumulates to increasingly higher levels. He further proposed that the energy dammed up in this manner induces appetitive behavior in the animal, causing it to engage in an active search for an appropriate target for the behavior in question or if such a target is not encountered, triggering the behavior without apparent external stimulation. Consequently, in the absence of appropriate aggression releasers in the environment, the aggression-deprived animal is expected to seek out aggression opportunities, to be ready to attack in response to increasingly less appropriate releasers, and finally to erupt in a stimulus vacuum (e.g. Lorenz, 1963, 1965).

This assertion of spontaneity in instinctive aggression, which was readily adopted by others (e.g. Eibl-Eibesfeldt, 1970, 1971; Storr, 1968), has drawn strong negative reactions from a great many highly competent biologists and psychologists (e.g. Bandura, 1973; Berkowitz, 1969; Hinde, 1967; Lehrman, 1953; Scott, 1967). The critics of Lorenz’s proposal point out that there is no neurophysiological evidence of any organismic structure that – in the absence of regular discharge – accumulates behavior-specific motivating energy to a point at which the specific behavior is forced upon the organism independent of external stimulation; nor is there evidence of a mechanism by which any accumulated behavior-specific motivating energy could enter other structures and – again in a stimulus vacuum – force out alternative related or unrelated specific activities (cf. Hinde, 1960; Scott, 1969, 1971, 1973).

The documentation provided to back the notion of spontaneous drive is extremely questionable. Lorenz initially reported the informal observation that a presumably aggression-deprived, tame jackdaw ‘attacked’ a pair of black swim trunks (1935/1965) and that a similarly deprived starling in the absence of insects in the environment behaved so as to ‘catch flies’ (1963). Somewhat more systematically inclined, Eibl-Eibesfeldt (1971) cites studies by Kruijt (1964), von Holst & von Saint Paul (1959), and Rasa (1969) to demonstrate both appetitive aggressive behavior and vacuum aggression.

Kruijt, who worked with fighting cocks reared in isolation, observed that these animals displayed the normal conspecific fighting patterns when permitted to combat rivals. More importantly, when deprived of opportunities to fight, they attacked their own tails or struck at their own shadows with their spurs. Von Holst & von Saint Paul found that electrical stimulation of specific brain areas induces motor restlessness in chickens and that the presence of any target, either appropriate or inappropriate, results in attacks. In these studies, increased habitual mobility is taken to document appetitive behavior, and the attack upon
seemingly any target is taken to show that increasingly less appropriate targets take on the stimulus quality of a releaser. However, Rasa’s study on cichlid fish is considered to provide the most direct demonstration thus far of the spontaneity of aggression. Rasa placed pairs of cichlids during the reproductive phase into one of three conditions: (a) together with other conspecifics so that fighting could occur naturally, (b) separated from other conspecifics by a glass partition so that fighting was restricted to visual engagements, and (c) isolated from conspecifics. It was found that when males were prevented by the glass from directly attacking male rivals, the average frequency of attack upon their mates increased slightly. More importantly, however, it was found that when males are deprived altogether of the opportunity to attack rivals, the average frequency of attack upon their mates increased by more than a factor of 3. Indeed, under the latter circumstances, the males’ attacks upon their mates, unlike ritualized fighting, tended to be continued to the mate’s destruction. These findings are certainly in accord with Lorenz’s notion of spontaneous aggression. However, aside from some methodological problems with the study (e.g., reproductive events were not entirely parallel, and time of observation differed notably – discrepancies that could have biased the conditions in terms of critical aggression-laden periods), the findings are open to alternative explanations. For example, since under natural conditions the mate is by no means free from attack (in Rasa’s study, nearly one-fourth of all attacks were directed against the mate), the fact alone that she – in contrast to male rivals – uninhibitedly continued to approach the hostile male while potentially aggression-diverting males were absent accounts for the reported increased attack frequencies. But whatever the ultimate explanation of the findings may be, it appears to be a tremendous leap indeed to generalize from the tentative findings on cihlid fish to all higher vertebrates. Lorenz’s assertion that all species, man included, are equipped with instinctive aggressive forces that – when not discharged by appropriate external stimuli – will result in a discharge toward potentially inappropriate targets or in vacuo can only be considered unfounded and unwarranted (Zillmann, 1979). Given this state of affairs, it appears rash, if not naive and irresponsible (cf. Schneirla, 1973) for anyone to project instinctive (and spontaneous) aggression upon all species irrespective of their placement on the evolutionary scale. In principle, such a projection assumes: (a) that ontogenetic development is confined within the narrow bounds of an aggression-specific phylogenetic dictum, and (b) that behavioral organization is essentially the same at all levels of evolutionary advancement. It would appear that only Lorenz’s preoccupation with lower vertebrates could have led him to make these assumptions. If the aggressive behavior of higher vertebrates – especially primates and man – is given adequate scrutiny, both assumptions appear quite indefensible (Zillmann, 1979).

Lorenz (e.g. 1942, 1963, 1964, 1965) posited very explicitly that instinctive aggressive energy, if it is not regularly discharged through aggressive action, accumulates to a point where it will force out aggressive behavior in the absence of appropriate environmental stimuli. Aggression in a stimulus vacuum – which seems to be at the center of the controversy concerning Lorenz’s proposals – is commonly related to the hydraulic energy model and interpreted as an overflow of the energy reservoir or the rupture and bursting of the container. In actuality, Lorenz (1950) detailed a hydraulic analogue of instinctive energy that is somewhat more elaborate.

In his energy model of instinctive actions, Lorenz conceived of energy as a liquid stored in a container. Energy is continuously provided through an input pipe. There is a constant flow of energy into the reservoir. The reservoir is drained through an output pipe. The outflow of energy is regulated by a valve that is controlled by a spring. This string responds (a) to the pressure inside the reservoir and (b) to the pull of external stimulation. The latter is represented by an outside weight that exerts a pull on the valve. Energy exits through a horizontal spout. Dependent on the pressure inside the container, it may drop close to the
container (at low pressure) or shoot farther away from it (at higher pressures). The energy passes through a scale grid and finally reaches a trough with a leaning, perforated bottom. The holes in the bottom correspond to instinctive actions. Holes in the lower area of the trough are associated with more basic instinctive actions than those in higher areas. The more characteristic forms of behavior are thus advantaged by the downward flow of energy in the trough. The more specific forms are elicited only at high energy levels. Specific and complete as the analogue may appear, it leaves some questions unanswered. A principal ambiguity that cannot be resolved concerns the closing of the valve. When is the exit flow of energy shut off? After the entire reservoir is drained? Is a constant or pressure-dependent amount released? Or is there a point of standard pressure at which the valve closes? It seems that another basic ambiguity can be resolved, however. Lorenz failed to specify the way in which the valve operates. It could control the outflow of energy either in a gradual manner or in an all-or-nothing fashion. Since Lorenz considered the pressure of exiting energy to represent the pressure inside the container, gradual release is ruled out. The valve apparently is conceived of as operating in an open-or-closed manner, with a certain force being necessary to affect the change from closed to open. Since Lorenz stipulated that energy release is possible in a stimulus vacuum, the pressure inside the container can apparently reach the level of this needed force (Zillmann, 1979).

As discussed earlier, Lorenz has been severely criticized for proposing that aggression is spontaneous in the sense that it may occur in a stimulus vacuum. This criticism, although valid, seems somewhat misdirected. The stimulus vacuum can be considered a contrived situation. Under prevalent environmental conditions, the organism is in all likelihood exposed to potential releasers frequently, and this prevents the presumed aggressive energy from ever damming up to ‘explosion levels’. The more relevant condition thus is that in which energy accumulates to relatively high levels and then finds outlet through minimal stimulation. As the organism is deprived of opportunities to behave aggressively, minimal provocation, so to speak, becomes increasingly likely to trigger outbursts of considerable intensity. The time of aggression deprivation, a word combination that is very meaningful in Lorenz’s model, can convert a weak releasing stimulus into a highly potent one. This is the crux of Lorenz’s conception of aggressive instinct. Trivial releasers, too weak to incite aggressive action, grow into powerful ones that force violent eruptions. The reason for this change in releaser potency is obvious: It is the constant influx of energy into the reservoir. The spontaneity of aggression is a direct outgrowth of the more basic assumption that within the organism, aggressive energy is (a) spontaneously produced at a constant rate and (b) capable of accumulating. The nonviability of this assumption has been detailed earlier.

A principal implication of Lorenz’s model is that if energy is continuously prevented from accumulating to higher levels, dangerous violent outbursts cannot occur, since they require larger amounts of energy. Gross destruction, it appears, can this be curbed by frequent participation in minor hostile and aggressive activities (which, taken together, are nonetheless as energy absorbing as the grossly destructive behavior). In man, a violent outburst, dramatically speaking, can be averted by a thousand naughty actions. Seemingly in accord with this interpretation, Lorenz (1963) has expressed great hopes for the curtailment of violence in society by such activities as the active or passive participation in competitive sports events. These hopes may appear to be a straightforward implication of the energy model; in fact, they are not. As was the case in Freudian reasoning concerning the death instinct, the rate of replenishment of drained energy is left entirely unclear in Lorenz’s model. It can only be speculated that similarly to the operation of a toilet tank, the reservoir was thought to be rapidly drained and not so rapidly refilled. Only if it is assumed that the replenishment of energy is a time-consuming process does it become meaningful to expect benefits from the drainage of energy by minor aggressive actions. In Lorenz’s model, the
treatment of the period of time that follows energy discharge and during which aggressiveness, as a consequence, is potentially reduced as far too vague to permit anything more than superficial analogizing (Zillmann, 1979). Finally, Lorenz’s conception of instinctive aggression involves a principal behavioral characteristic that is not an element of the energy model and that, presumably because of this, is usually overlooked. Lorenz (e.g. 1950) was most insistent that aggressive behavior, conspecific and nonpredatory interspecific fighting included, has an appetitive component. In the context of the energy model, this proposal implies that the organism is provided with feedback of accumulating pressure. As the energy reaches a certain threshold, this feedback triggers search activities. It is said that the organism seeks out opportunities to engage in aggressive behavior and that it may invest considerable efforts in so doing.

The implications of this reasoning are twofold. First, it could be suggested that the posited behavior has adaptive value because – within Lorenz’s instinct theory – it shortcuts the energy accumulation. Locomotion generally increases the likelihood of encountering a releaser, and energy discharge thus occurs before the buildup of extreme levels. However, since vacuum behavior, like a safety valve, is there to prevent abnormal and intolerable levels, searching for aggression opportunities would seem to result in trivial gains only. The opposing argument, namely that the search, by increasing the frequency of encounters, places the individual at greater risk of injury and thereby ultimately endangers the species, appears more compelling. Second, the search proposal can be seen to supplement the notion of spontaneously accumulating, instinctive aggressive energy in that it once more stresses the inevitability of aggression. As in Freudian thought, there is absolutely no escaping violence. According to Lorenz, if aggression does not find us, we will find it – because of the way we are built (Zillmann, 1979).

What the layman calls ‘aggression’ is, in ethological terms, comprised of motor coordinations (behavior) and moods or feeling-states (which, in humans, seem to closely related to emotions). When Lorenz proposed that aggression plays a functional role in the ‘parliament of instincts’ (Lorenz, 1966), for most readers he was asserting that aggressive – if not violent – behavior is natural and inevitable. In fact, he merely suggested that the moods or emotions associated with aggression have been, in most vertebrates, highly adaptive; so much so, indeed, that Lorenz argues against attempts to ignore these emotions or to reduce them entirely to cultural ‘causes’ (Masters, 1979).

As presented, Lorenz’s hypothesis did not presume that aggressive or violent behaviors, such as murder, war, and rioting, are innate or desirable; quite the contrary, his intention was to show how aggressive emotions might be dissociated from human violence and redirected toward other behaviors. Apart from the tendency to confuse function and cause in popularized writing, Lorenz’s thesis was misinterpreted by readers who assumed that his discussion of aggression referred primarily to behavior – or to behavior and emotion as a single unit. The result is, as Masters (1979) points out, that discussion of the supposedly ‘natural’ status of human aggressiveness was long bogged down in a confused morass, in which hypotheses about the functionality of aggressive moods were criticized using evidence of the causation of aggressive behavior (e.g. Montagu, 1968).

Although Lorenz (e.g. 1965) has more recently come to acknowledge the significance of ontogenetic factors in the development of aggressive behavior, his major contention remains that aggression is nearly entirely phylogenetically controlled and that ontogenesis involves only a minor potential to modify innate behavioral dispositions. Considering fish and birds, this may well prove to be a workable assumption. But the extension to such species as mice, rats, cats, and dogs is already troublesome and reveals the inadequacy of the assumption. For example, it has been demonstrated convincingly that when the attacks of mice are made to be
consistently successful, the mice develop into extremely aggressive, ferocious fighters and that – more importantly here – when mice are made to be consistently unsuccessful in fights, they develop into nonaggressive, timid animals who will not attack others (Kahn, 1951; Scott, 1958, 1966). Contrary to expectations that follow from the assumption of spontaneity in aggression, in the absence of external stimulation to fight (e.g. the infliction of pain by another animal), mice trained to live nonaggressively display no ill effects whatsoever (Scott, 1971; Scott & Marston, 1953). Dogs have also been trained to be arbitrarily either peaceful or vicious in competing with members of their own species (Kuo, 1967). It thus has been shown that experiential factors can have an enormous influence on the development of conspecific aggressive behavior (Zillmann, 1979).

Also Rasa (1980) draws attention to what she calls “the malleability of agonistic behavior”. There is probably no other motivational complex which responds to positive and negative experience so radically and rapidly as the agonistic one. This is one of the factors which makes the study of aggression (here used in the sense of ‘property protection’) so complicated. Scott & Fredericson (1951) were some of the first to study this phenomenon, investigating the effects of fighting success on the latency to attack in mice. Their results showed that, if a male mouse experienced success in fighting, its latency to attack an opponent decreased rapidly with subsequent successful fights and thus came to the conclusion that aggression was learned and that the animals became more aggressive with experience. Rasa (1980) recently repeated their experiments. Similar to her studies on juvenile Damsel fish (Rasa, 1969, 1970) where she could demonstrate that successful fighting was rewarding and reinforced a learned behavior pattern for aggression the same tendencies are present in mice. The possibility of engaging in a successful fight where the outcome is known and fear tendencies reduced is positively reinforcing for the animal. Fights in which fear, pain and stress are the outcome, are avoided. It would be unadaptive for the organism to seek them out, hence negative experience in the fight situation would reduce appetence. If, however, through fighting, an animal can better its position with respect to access to resources, it will do so, especially when the gain outweighs the cost.

This finding has implications on a wider ethological scale. In animal communities there is always a discrepancy between the physical states of individuals. Some are mature, larger, stronger; others may still be youngsters, relatively weak and lacking in experience. The rapid learning associated with the results of an aggressive encounter must play an important part in the regulation of readiness to engage in a subsequent encounter and thus protect gene material which may be of later value to the species. It would be maladaptive for young animals to continually engage in fights with older individuals, fights which, owing to their inexperience and relative weakness, they would almost certainly lose. Negative experience on only one or two occasions may be sufficient to inhibit further encounters for a period of time whereas a later successful fight with an opponent equal in strength may prevent fighting tendencies from being completely erased. Data provided by Rasa (1980) substantiate the hypothesis that negative experience in the fight situation has an inhibiting effect on engaging in future fights, this period of inhibition in the mouse strain used lasting approximately 6 days (or, more correctly, 6 encounters with an antagonist). What is equally important (or, more correctly, 6 encounters with an antagonist). What is equally important to note, however, is that a single successful agonistic encounter acts as a positive reinforcement and, subsequent to it, fighting behavior is engaged in when future opportunities present themselves. For these mice, approximately 3 successful agonistic encounters are necessary before the animals’ attack latency is significantly reduced, thus indicating that a single successful fight, although a positive reinforcement, is still not sufficient to erase the memory of previous negative encounters completely.
Similarly, van der Molen (1972 et seq.) was able to show that by manipulating only the 'training-frequency' or 'resting-in-isolation period', trainees (male mice of the CPB’s strain) could be transformed from inexperienced males into either 'fearful fleeing males' or 'skilled fighters', using an intruder paradigm. If males had grown up in a social group, they varied greatly in their reactions when introduced into a strange 'group'. In general, males with a background of 'normal' social experience were rather well able to hold out against avalanches of territorial aggression. A ‘normal’ social history apparently provided ample opportunity for these mice to 'digest' their aggressive encounters in such a way that they became skilled in dealing with agonistic social situations.

The training required for turning an inexperienced male into a ‘coward’ is almost the same as the training needed to turn him into a ‘hero’. The only difference is that in the former training schedule less ‘digestion time’ is available for every experience than in the latter. This ‘critical digestion time’ or ‘recovery period’ varies somewhat between individuals.

Rasa (1980) comments that it is on the basis of this shaping of aggressive and fear tendencies through experience that animal societies can be built up and maintained, for in all social species in which individual recognition is present, a dominance structure of some sort is evident. This dominance may even be established through a single agonistic encounter which then ‘fixes’ the position of the antagonists with regard to one another for a long period of time afterwards and further fighting is superfluous. In some cases, this relationship can even be fixed very early in ontogeny and may be maintained for the whole of the animals’ lives as in pigs (McBride, 1963), giraffes (Leuthold, 1979), dwarf mongooses (Rasa, 1976) and rhesus monkeys (Southwick & Siddiqi, 1967). The advantages of such a system for the species as a whole are obvious, especially if the society consists of close relatives. In contrast to serial fighting throughout the animal’s life, its place in the social structure is fixed with a minimum of energy expenditure during a relatively short timespan. Such a system would be advantageous for the development of roles and altruistic behavior and would enable a society to increase in complexity, since relationships within it are not constantly in a state of flux.

With regard to interspecific aggression, predation in particular, the significance of ontogenetic processes has been demonstrated even more dramatically. For example, Kuo (1930) studied behavior that is quite universally regarded as innate: rat killing in the cat. He investigated the degree to which such behavior depends on experiential factors by raising kittens from birth to maturity under the following controlled environments: (a) the kittens occasionally witnessed their mother chase and kill rats; (b) the kittens were brought up in isolation from rats; and (c) the kittens grew up in company with rats without ever witnessing rat killing. Under the quasi-natural conditions in which rat killing was witnessed, 86 percent of the kittens became rat killing adults. Of those growing up in isolation from rats, only 45 percent spontaneously killed rats as adults. And of those who grew up along with rats but never witnessed killing, only 17 percent killed rats as adults. Similarly, neutral contact – particularly friction-free social interaction between animals that are usually in a predator-prey relationship – was found to reduce the predator’s aggressive assaults upon its potential prey almost totally (Kuo, 1938). By creating the appropriate environmental conditions during the course of ontogenetic development, Kuo (1938, 1967) was furthermore able to rear kittens so that as adults, they would either fear such customary prey as rats and birds, affiliate with them, affiliate with one kind of rat and kill others (shaved ones), or kill mice and be ‘friendly’ to rats. Similar studies have been conducted more recently to explore nonpredatory interspecific aggression. It has been shown, for example, that although rats ordinarily attack mice, few if any will attack and kill mice if the two species have been raised together (Denenberg, 1966; Denenberg, Hudgens & Zarrow, 1964; Denenberg, Paschke & Zarrow, 1968; Myer, 1969). Finally, cross-species attachments caused by atypical ontogenetic development in animals that are commonly hostile toward one another have been reported for
many species, including monkeys with rats (Mason & Green, 1962) and dogs with lambs (Cairns, 1966).

Taken together, these findings are clearly at variance with the view that ontogenesis merely serves to develop specific aggressive behaviors that are phylogenetically fixed in the various species. It is obvious that ontogenesis can greatly modify the development of aggressive behavior. Its power to modify is in fact so extreme that it becomes difficult to see what, precisely, should be considered phylogenetically determined. In the study by Kuo (1930), which half of the cats reared in isolation from rats behave in the ‘phylogenetically proper’ manner – those that kill rats or those that do not? Or as Kuo (1967) put it: “Which of these two types of behavior pattern is the result of nature and which of nurture?”

Kuo’s (1967) theory stresses the enormous possibilities or potentialities for behavior development with which every species, but particularly the vertebrates, is provided genetically. It treats these potentialities as physical capabilities without implying any inborn behavioral dispositions. Genetic factors thus merely determine the boundaries of the range of behavioral potentials. During the course of behavior development, some of these potentials manifest themselves as a function of environmental conditions, and the remainder – a vast number of potentials -maintain latent status.

Conceivably, ontogenetic adaptability in invertebrates and lower vertebrates is extremely limited and can be neglected without loss. For example, a praying mantis might be unable to adapt to an environment by feeding on seeds instead of killing and ingesting the insects it commonly preys on. Similarly, cichlid fish might display their conspecific fighting behavior in all imaginable environments. In contrast, ontogenetic adaptability in mice, rats, cats, and dogs has been shown to be pronounced enough that claims of instinctive aggression are not reasonable. It seems fair to say, consistent with available evidence, that for these species, aggressive behavior is primarily **ontogenetically controlled**. Both aggressive and nonaggressive modes of adaptation can be seen as phylogenetically determined, but the crucial adaptive selection of one or the other mode is an ontogenetic process. Considering that ontogenesis thus dominates behavior development in subprimate species, and in view of the immensely greater adaptive flexibility of the primates and man, it appears conservative and safe indeed to infer even stronger ontogenetic dominance in the behavior development of primates and man (Zillmann, 1979).

**Is aggression beneficial?**

Also Hinde (1971) points to the problems of definition in relation to natural selection: “if aggressive behaviour is held to include all ways in which men expresses his individuality or asserts himself over his physical environment, we should clearly be badly off without it. But surprising as it may seem, there are some who argue that aggressive behaviour defined in the narrow sense of behaviour likely to cause physical injury to others is a desirable human characteristic. Such arguments rest on loose thinking. For instance, the view that aggressive behaviour must be desirable because it arose through natural selection involves confusion between advantages to the individual and advantages to the species, and neglects the changed social environment in which man now lives. The view that aggressiveness is beneficial because it ensures that the fitter individuals get precedence in access to valuable commodities equates fitter with more aggressive and is therefore circular; implies that society wishes to preserve the more aggressive individuals; and neglects other ways of reducing competition”.

Subsequently, Hinde (1974) extended his arguments as follows:
Some argue that since aggression arose through natural selection, it must be valuable to the species. Several points must be made here. Natural selection operates primarily through individuals. A trait is selected because those individuals that possess it are most likely to survive and reproduce. The question of whether a trait is valuable to the individuals that possess it is an entirely different one from that of whether the possession of the trait by some individuals is valuable to the group to which they belong. In our own society those who are prepared to use physical violence may be able to achieve their own ends more readily than others, but that is not the same as saying that their behavior is beneficial for society. Another point about the argument that aggression must be beneficial because it arose through natural selection is that, when applied to man, it neglects his rapid cultural evolution. This has placed him in circumstances quite different from those in which natural selection operated, so that traits which were selected for in protohominids may be maladaptive now.

It is also suggested that aggression is beneficial to the species because it ensures that the fitter individuals get priority of access to food, mates and other valuable commodities (e.g. McDougall, 1923; Ulrich & Symannek, 1969). In that fitter is equated with more aggressive, the argument is circular and also implies that the more aggressive individuals are the ones that society wishes to perpetuate. Not all would agree with this view. If fitter is not to be equated with more aggressive, the argument fails through lack of evidence for a correlation between aggressiveness and fitness in other respects. Even where there is a correlation (Lagerspetz, 1964; Karczmar & Scudder, 1969), the nature of the causal link still has to be investigated; for instance, both could be consequences of more efficient metabolism. As applied to animals (e.g. by Boelkins & Heiser, 1970) the view that aggression is beneficial to the species in this way involves the false view of natural selection discussed in the preceding paragraphs. As applied to man, it also overlooks the fact that there are other ways of reducing competition. Yet another argument is that a hierarchical structure in society ensures peace and order within the community and that the aggression involved in its maintenance is therefore, in the end, beneficial (e.g. Stokes & Cox, 1969). Clearly this would be unnecessary if aggression were not potentially present. The argument thus has a modicum of circularity. Presumably what is meant is that societies with a hierarchical structure imposed from above are often stable. But the stability, far from being a beneficial consequence of the aggressiveness of individuals, occurs in spite of it. The ordered dominance system gains stability only when the subordinate individuals cease to challenge the more aggressive ones – presumably because it is better for them to accept a subordinate position than struggle against hopeless odds (Stokes & Cox, 1969). And whether it is beneficial for the society as a whole depends on the values of those at the top.

Now of course law and order must be maintained, but a social order based on a hierarchical system maintained by force may not be so desirable as it seems. It may conceal untold tensions. And support for such an imposed hierarchy because it ensures government by those fittest to govern implies a positive correlation between strength and wisdom not always borne out by common experience. Such support becomes even more positively objectionable when it is further implied (e.g. by Storr, 1968) that pariah castes, such as the Untouchables of India “serve a valuable function in human communities for the discharge of aggressive tensions”. The Untouchables would be unlikely to share this view.

It is also often said that aggression forms part of many normal and pleasurable human activities. Some, for example, have argued that aggressive male dominance is essential to the relations between the sexes. Not many would nowadays agree with this view as applied to man. Among animals, while aggressive and fleeing responses are often closely interwoven with sexual ones, they interfere with mating rather than promote it. In fish and birds courtship displays are usually given during a period in which male dominance is reduced to a point at
which mating is possible (Tinbergen, 1959; Hinde, 1970); and in fish, birds and mammals a high tendency to aggression may interfere with mating (King, 1956; Sevenster, 1961; Lagerspetz, 1959). Under certain circumstances the occurrence of aggressive behavior, in addition to having a short-term negative effect on sexual behavior, may also be correlated with a long-term positive one (Sevenster, 1961). However, there is no evidence that the long-term effect is specific to aggression, and it may be mediated by a change in general arousal affecting many different activities (Wilz, 1972).