

# Toward an ethology of human conflict: a review

Konrad Lorenz, *On Aggression*

London: Methuen, 1966. Pp. 306. \$5.75.

Robert Ardrey, *African Genesis*

New York: Atheneum, 1961. Pp. 380. \$6.95.

Robert Ardrey, *The Territorial Imperative*

New York: Atheneum, 1966. Pp. 390. \$6.95.

Claire Russell and W. M. S. Russell, *Human Behavior—A New Approach*

Boston: Little, Brown, 1961. Pp. 532.

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The study of human conflict seems to labor under three major difficulties: the dislike of the majority of people for viewing man in his evolutionary perspective; the tendency of any specialist to consider his own speciality as more relevant than any other applied to a problem of common interest; and the universal stumbling-block of man's sheer lack of ability to deal successfully with his social problems at the community level. All of the four books under review at least manage to avoid the first difficulty, and one of them brings powerful argument to play upon the other two.

These four books have already had con-

siderable impact. Those of Ardrey and that of Lorenz are best-sellers, and the Russells' book had an enthusiastic reception among the members of that small ingroup of biologists and humanists forming a tenuous bridge between the "two cultures." When taken together—though such a mixture is very strong medicine—they indicate a significant (albeit controversial) development in the study of man as an organism, that is, as an animal which has evolved, like other animals, by mechanisms of natural selection. Unfortunately, unlike other animals, man now seems to be developing characteristics of "unnatural" selection which give concern

to many people, including the authors of these books and of this review. Certainly, no other animal exhibits anything like the degree of intraspecific killing and maiming shown by our own species. Whether any of the extinct animals owed their extinction to this kind of behavioral breakdown we shall probably never know, but what we must be clear about is that it is a behavioral breakdown—a biological malfunction—and that the behavioral biologist—the ethologist—is particularly fitted to study it.

Ethology, as I have indicated, and as Lorenz himself (1965) has stated, may be regarded as the biology of behavior. This description, however, needs clarification. Anyone studying the behavior of organisms is studying biological phenomena, yet many students of behavior—psychologists, sociologists, psychiatrists, anthropologists, and so on—have little or only partial biological training. The ethologist has the distinction of being properly qualified, without obvious limits, for the study of his subject; he has training both in biological science and in behavioral observation and analysis. The ethologist tends to be a student of the whole animal which, strictly speaking, is the normal animal in its natural environment. To be a “pure” ethologist is obviously, therefore, very difficult, and most ethologists compromise to some degree by putting some kind of restriction upon their animals. This need not, however, result in significant distortion of the animal’s behavior, and the ethological approach to behavior would seem to be the most objective and potentially valuable of the behavioral sciences.

It should be mentioned that ethology is not just another “ism” among the plethora of recently-emerged subdisciplines of natural science. Although the term “ethology”—in its present sense—was first used in English by W. M. Wheeler as recently as 1902, the history of ethology as a rigorous

discipline of objective observation of behavior is a much longer one. Charles Darwin, of course, included an understanding of ethological principles in his battery of biological techniques. Nora Barlow, Darwin’s granddaughter and authority on his writings, has pointed out in a personal communication that in his work on barnacles, which predated *The Origin of Species*, he was all the time “thinking of behavior, exactly how the animal lives, and its needs.” The same can be seen in his *Journal of Researches* (1839). More strictly ethological were the studies on “instinct” carried out by Douglas Spalding (Haldane, 1954), a contemporary of Darwin and, briefly, tutor to Bertrand Russell. But such studies—and there were many others—were only a natural development of the British tradition of the scientific study of natural history, first clearly revealed in Gilbert White’s classic, *The Natural History of Selbourne* (1789). White was the first to make a clear distinction between the three common British species of leaf-warbler—and did it on the basis of their behavior. And his distinction is as valid today as it ever was.

The work of Lorenz, of Ardrey, and of the Russells represents the natural development of the earlier naturalists’ approach to animal behavior, only now it is scientific, with a rigorous methodology and standards of quality equivalent to those of any other scientific discipline. At the same time it must be noted that the work of Lorenz and of Ardrey attracts a good deal of fierce criticism from mathematically-oriented ethologists and psychologists. Such critics seem to feel that the Lorenzian type of ethology is unscientific, apparently because much of the data it collects cannot be subjected to the processes of mathematical analysis found to be useful in other types of behavior study. I believe that this criticism may be an unwise one. As Slobodkin (1965) has

pointed out, every empirical science has to develop its own standards of quality, and "to insist on the theory of biology conforming to aesthetic standards derived from extant mathematics is illegitimate and is, in fact, an imposition of metaphysical criteria on the empirical world." While all students of behavior must beware of "intellectual exercise carried out in the dark void of contemporary ignorance of cerebral functions" (Walshe, 1957), the ethologist working with animals under relatively natural conditions can be confident that his activities will introduce a minimum of undetectable variables into his experiments. It is in this light that the books here under review should be considered.

*On Aggression*, written by one of the leading biologists and the most celebrated ethologist of our time, has been reviewed by a number of eminent people from several fields. The variety of response to the book is of interest in itself, and though it cannot be considered here in detail,<sup>1</sup> it is worth noting that those who approve are largely experts in other fields. These include Alsop (1966), Gorer (1966), Koestler (1966), and Mead (1966). Those against—all working somewhere in the field of animal behavior—are, principally, Barnett (1967), Schneirla (1966), and Zuckerman (1966). I believe that this antagonism from other behavioral scientists is only partly explained by Lorenz' tendency to make broad sweeping assertions, e.g., "I am honestly convinced that in the near future very many men—indeed perhaps the majority of mankind—will regard as obvious and banal truth all that I have written in this book about intra-specific aggression and the dangers which its perversion entails for humanity."

It may have been unwise for Lorenz to allow this statement to be printed on the dust-jacket of the book, but even so it should not prejudice the reader against everything he says. Anyone who has seen Lorenz at work will know that he is very rigorous indeed, and can predict more accurately than the majority of people what an animal will do next. He clearly has a *fingerspitzengefühl*—one of his favorite words, meaning roughly, "fingertip sensitivity"—for animal behavior study, and a fertile and broadly-integrated mind. The Russells' book provides evidence to suggest that certain kinds of regressive thought process, notably rationalization, in the sense used by Freud, common to all of us—though to varying degrees—are antipathetic to the broad approach, and may be operative in the negative reactions to Lorenz's work.

*On Aggression* is a book which must be taken very seriously, as it provides a powerful thesis to explain the behavioral breakdown which has resulted in the deaths of more than sixty million humans since 1820 as a result of internecine strife. Basically this thesis is that aggression in the proper sense of the word is intraspecific aggression, and normally fulfills a *species-preserving* function. The fantastic aggression we see in humans today is aggression gone wrong, out of hand, and now resembling in its results the predator/prey combats in which the predator's behavior has been evolved for the purpose of killing the prey. Intraspecific aggression is normally (that is, in most or all animals other than man) only superficially similar to predator behavior, which is both business and pleasure—hunting, not war. "The buffalo which the lion fells provokes his aggression as little as the appetizing turkey which I have just seen hanging in the larder provokes mine. The difference in these inner drives can clearly be seen in the expression movements

<sup>1</sup> For further information see Letters, *Scientific American*, May 1967, and Driver, 1967.

of the animal: a dog about to catch a hunted rabbit has the same kind of excitedly happy expression as he has when he greets his master or awaits some longed-for treat. From many excellent photographs it can be seen that the lion, in the dramatic moment before he springs, is in no way angry. Growling, laying back the ears, and other well-known expression movements of fighting behavior are seen in predatory animals only when they are afraid of a wildly resisting prey, and even then the expressions are only suggested." Lorenz could quite well have made his statements in behavioral jargon rather than widely intelligible prose, and this would perhaps reduce some of the negative criticism. But it has been well-stated that the truly great scientist has no need of jargon; fundamental truths are self-evident when stated simply. It is the mediocre scientist who takes refuge in cryptic clouds of technical verbiage.

The difference between interspecific and intraspecific aggression, as Lorenz points out, is that intraspecific aggression is usually ritualized; that is, though superficially like mortal combat, it has certain characteristics of exaggeration of action and emancipation from its original occurrence (in a predator/prey context), so that the actor's performance is instinctively recognized by the reactor as being something qualitatively different from a mortal threat. And there are the built-in insurances of submission postures and associated inhibitions for the occasions when, in social animals such as dogs, one individual is in real trouble in an intraspecific contest. The gesture of turning away the jaws (and offering the side of the neck, with its thinly covered jugular vein) is instinctively performed, as is the cessation of attack on the part of the dominant combatant.

It is, of course, much easier to see the survival value of interspecific combat than

that of intraspecific aggression. If the latter is a fundamental characteristic of animal organization, then we must be able to postulate a selection pressure strong enough for it to be widely incorporated in behavior repertoires. Lorenz deals with this problem convincingly and in a manner that is, biologically, perfectly respectable: "The danger of too dense a population of an animal species settling in one part of the available biotope and exhausting all its sources of nutrition and so starving can be obviated by a mutual repulsion acting on the animals of the same species, effecting their regular spacing out, in much the same manner as electrical charges are regularly distributed all over the surface of a spherical conductor. This, in plain terms, is the most important survival value of intraspecific aggression." And again: "Unless the special interests of a social organization demand close aggregation of its members, it is obviously most expedient to spread the individuals of an animal species as evenly as possible over the available habitat. To use a human analogy: if, in a certain area, a larger number of doctors, builders, and mechanics want to exist, the representatives of these professions will do well to settle as far away from each other as possible." This is now one of the well-established facts of life and Lorenz documents it well, including his own careful observations of the multitude of highly varied species of coral reef fish of the Florida Keys.

He also provides broad and compelling documentation of what he calls "behavioral analogies to morality," including the submission postures and inhibitions already mentioned. Now comes a crucial question: Why does man not have such instinctive inhibitions? Lorenz's answer, with which I agree, is that in human evolution no such inhibitory mechanisms were necessary; quick killing was impossible and a potential

victim had time to bring other methods of avoidance or appeasement into play. "No selection pressure arose in the prehistory of mankind to breed inhibitory mechanisms preventing the killing of conspecifics until, all of a sudden, the invention of artificial weapons upset the equilibrium of killing potential and social inhibitions." Man then was in an analogous position to that of harmless animals like doves which, when under closely confined conditions, will fight to such an extent that the weaker ones are killed slowly and with great suffering. Similarly, as man's environment becomes more artificial and confined, so his aggression becomes more harmful. It can be no accident that the most humane peoples are some of the more isolated groups of Eskimos, the Arapesh of New Guinea, the Lepchas of Sikkim, the Ituri of the Congo, and some other technologically "backward" and isolated tribes (Gorer, 1966).

Another major problem Lorenz deals with by evolutionary analogy is the human "r-race." He quotes his mentor, Oskar Heinroth, who used to say, "Next to the wings of the Argus pheasant, the hectic life of Western civilized man is the most stupid product of intraspecific selection!" The hen Argus pheasant is particularly attracted to the huge wing feathers of the cock, which are decorated with beautiful eye spots. Lorenz notes: "The number of progeny produced by a cock in a certain period of time is in direct proportion to the length of these feathers, and, even if their extreme development is unfavorable in other ways—his unwieldiness may cause him to be eaten by a predator while a rival with less absurdly exaggerated wings may escape—he will nevertheless leave more descendants than will a plainer cock . . . the evolution of the Argus pheasant has run itself into a blind alley." He compares this with the human state: "The rushed existence into

which industrialized, commercialized man has precipitated himself is actually a good example of an inexpedient development caused entirely by competition between members of the same species. Human beings of today are attacked by the so-called manager diseases, high blood pressure, renal atrophy, gastric ulcers, and torturing neuroses; they succumb to barbarism because they have no time for cultural interests. And all this is unnecessary, for they could easily agree to take things more easily; theoretically they could, but in practice it is just as impossible for them as it is for the Argus pheasant to grow shorter wing feathers."

I have quoted enough, I think, to indicate Lorenz' style and "message." What I want to stress is that his comments are based on a very broad, and in many cases deep, knowledge of the animals and the types of behavior he discusses. And he is a scholar, in the best sense of the word. Add to this his respect for the teaching of Charles Darwin, and his conviction that "Unless one understands the elements of a complete system as a whole, one cannot understand them at all," and one has an idea of how important *his* teaching—if he is right—must be.

It is, of course, one thing to recognize a problem such as that of human aggression, and another to suggest methods of alleviating that problem. But here, too, Lorenz makes some powerful suggestions. Few people will disagree with his first suggestion: the old "Know thyself." And the ethological approach would seem to have much to offer here. His second suggestion is the psychoanalytic study of "sublimation" or redirection as a means of controlling aggression. Certainly there are plenty of examples from other species of intraspecific aggression being reduced by "redirected" activities. And psychoanalysis would seem

to show that "many patterns of altogether laudable behavior derive their impulses from the 'sublimation' of aggressive or sexual drives." The third suggestion is fairly obvious but "still worth mentioning: it is the promotion of personal acquaintance and, if possible, friendship between individual members of different ideologies or nations." Lorenz indicates how this may have beneficial results which would not necessarily be expected. The fourth measure suggested is "the intelligent and responsible channeling of militant enthusiasm, in other words helping a younger generation which, on the one hand, is highly critical and even suspicious, and, on the other, emotionally starved, to find genuine causes that are worth serving in the modern world." And this, of course, is just what voluntary service organizations are attempting in various parts of the world. If Lorenz is right there may be more value in such service than has been hoped for.

The most significant of the vast field of evolutionary and behavioral phenomena covered by Lorenz in his book are considered in more detail by Ardrey and by the Russells, and their books lend considerable weight to his conclusions. Ardrey is not, by training, a biologist, yet he has a distinct knack for surveying biological topics in such a way that he not only recognizes the fundamentally important works and workers, but also discovers and integrates important matters that have hitherto been overlooked. A hundred years ago he would probably have rescued Mendel's work from obscurity well in advance of its actual discovery. But Ardrey's books are—to many biologists—peculiarly frustrating. Many of his deductions seem to be sound, but, possibly because he is not well-enough versed in evolutionary science, he spreads his net too widely in his enthusiasm for evidence which supports his ideas, and the mesh is too fine.

Yet he writes with such clarity, style, and excitement, and is, on the whole, so perceptive, that one is carried along with him in spite of his occasional deviations from the straight and narrow. After all, if a theory is founded on data *some* of which are found to be unsound, this need not discount the rest of the data, or the theory.

*African Genesis* is subtitled "A Personal Investigation into the Animal Origins and Nature of Man." During this investigation, as the book jacket tells us, "For six years Mr. Ardrey commuted between the museums and libraries and laboratories of the North, and the game reserves and fossil beds of Africa. Most of the information he sought was known only to the most advanced scientific specialists and to workers in the field. His investigations spread out beyond the simple though terrible question concerning man's affinity for war and weapons. It came to include many an institution and persuasion regarded as exclusively human: nationalism and patriotism, private property and social order, hierarchy and status-seeking, even conscience. All revealed roots in our most ancient animal beginning and parallels in primate societies."

This is not only an accurate indication of what the reader may expect from the book—and in this the publishers are to be congratulated—but it also points to the underlying dictum of all these books: given the undeniable fact that our structure has evolved from that of preexisting species, we must assume that our behavior has also, and that our structure or behavior can therefore be evaluated in the light of the structure and behavior of our closest evolutionary relatives.<sup>2</sup> This is simply a reflection of what Ardrey quite properly calls "the contem-

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<sup>2</sup> Further discussion of this and other related topics may be found in Driver (1967) and Thorpe (1966).

porary revolution in the natural sciences," the vast leap forward in our understanding of animal behavior and of our link to the animal world. Yet, as he points out, this revolution "has proceeded in something more striking than silence. It has proceeded in secret. Like our tiny, furry, squirrel-like, earliest primate ancestors, seventy million years ago, the revolution has found obscurity its best defense and modesty the key to its survival. For it has challenged larger orthodoxies than just those of science, and its enemies exist beyond counting."

What has held back this revolutionary information? This is a problem—and a very serious one—which is partially explained in the Russells' book. Also, as Ardrey notes, "A certain justification has existed until now . . . for the submission of the insurgent specialists to the censorship of scientific orthodoxy. Such higher bastions of philosophical orthodoxy as Jefferson, Marx, and Freud could scarcely be stormed by partial regiments." But then, in 1961, when *African Genesis* was first published, the "overwhelming body of incontrovertible proof" for man's animal origin, which Ardrey considered a prerequisite for action, was available, and he immediately began on his second book, which enlarges one particularly important aspect of the first. And slowly, much too slowly for some of us—for there is need for haste—the real facts of life and of death are being communicated; here by an enthusiastic teacher, there by a best-selling book, here by experimental evidence, there by generalizations acceptable to a wide range of specialists (so long as they have not been blinded by the new medievalism which restricts the laws of nature to those of physics, chemistry, and mathematics).

It has been to Ardrey's—and our—advantage that he is a generalist. "I have listened to geologists, ecologists, and zoolo-

gists in America; anthropologists, palaeontologists, and meteorologists in London; archaeologists, anatomists, and biologists in South Africa; primate specialists in Central Africa, reptile specialists in California and the Transvaal, mammal specialists in Pretoria and Nairobi, game wardens in the vast reserves of Uganda, and the Congo, South Africa and Kenya." It is remarkable that he has managed to integrate such a wide range of information so acceptably to so many specialists. Not that he is without critics: he annoys most of us in one way or another; but the likelihood of his observations being largely correct is high. The validity of his conclusions may be another matter.

*African Genesis* is concerned with two major themes: the concept of territory, developed more fully in Ardrey's second book, and the evidence for man having arisen from a killer prehuman. The information he provides on territory and associated matters such as the "pecking order" and other kinds of hierarchy is, on the whole, fairly sound. Ardrey has talked to the right people and read the things he should have read. But one gets a recurring feeling of annoyance when he reveals that, although he is a convert to the field of ethology, he is ethologically naive. He seems to find the contemporary revolution so overwhelmingly exciting that he forgets the necessity for keeping the emotions rigorously under control so that they do not run away with the intellect and use it to rationalize an emotional bias. But I cavil too much. For the account of the contemporary revolution alone this is a very important book. It is also of great importance for the light Ardrey sheds on the various controversies concerning man's immediate ancestors.

Some 800,000 years ago there lived, around the edge of Africa's Lake Victoria, a small, advanced, man-like ape, *Austra-*

*lopithecus africanus*. Ardrey gives much detail of the work of Raymond Dart, who discovered this controversial creature in 1924. The controversy centers on Dart's belief that *A. africanus* used weapons, certainly for hunting, and probably for fighting his fellows, and although the controversy continues, the evidence which Ardrey presents in support of Dart's belief is overwhelming. And it must be recorded that in this context Ardrey seems to be rigorous in his assessment of the evidence.

Indeed, it is difficult to see why there has been so much resistance to the suggestion that this prehumanid used weapons—the distal end of the humerus of a medium-sized antelope as a club, and the lower jaw of a small antelope for slashing—unless, as Ardrey suggests, the reaction is a psychological one. It could well be due to the romantic fallacy that “all human behavior, with certain stated exceptions, results from causes lying within the human experience.” Thus the majority of anthropologists may have rejected the suggestion that a possible forebear of man was a killer because this would imply that man was born a killer. Yet there is an increasing amount of evidence to indicate that this reaction is illogical. We know that the California sea otter holds a stone on its chest to use as an anvil for the breaking open of clam shells (Hall and Schaller, 1964); chimpanzees use sticks as tools, and throw sticks, stones, and vegetation in both playful and aggressive encounters (Goodhall, 1964); the woodpecker finch of the Galapagos uses a cactus spine for poking insects out of tree bark (Lack, 1947); and Egyptian vultures throw stones at ostrich eggs to break them open, and then devour the contents (the van Lawick-Goodhalls, 1966). Surely we cannot deny to a man-like ape what would be only a minor variation of such behavior?

We must agree with Ardrey's support of Dart in this.

But I do not agree with Ardrey's assumption that man therefore *was* born a killer. We do not know that *A. africanus* was on the direct line of human evolution, and if he was it would have been a very unusual example of selection that would develop a weapon suitable for killing conspecifics without the built-in safeguards evolved by all other well-armed animals. For the moment, Lorenz's assessment seems the more accurate: we became human before we had weapons with which we could kill our fellows.

In *The Territorial Imperative*, subtitled “A Personal Inquiry into the Animal Origins of Property and Nations,” Ardrey shows an interesting maturity of biological scholarship. Not only is he impressive in his coverage of the field but he also shows an increasing understanding of evolutionary phenomena. Anyone could profit from reading this book, which Ardrey dedicates fittingly to H. Eliot Howard who, in 1920, published his *Territory in Bird Life*. This was, “until this present volume, the only book devoted solely to the innate relationship between property and inanimate behavior.”

From Eliot Howard, Ardrey threads his way competently through the maze of literature on territory, and the complex behavioral phenomena associated with it, up to the contemporary and controversial *On Aggression* and V. C. Wynne-Edwards' *Animal Dispersion in Relation to Social Behaviour* (1962). He first deals with instinct, and I thank him for pointing out the inadequacy of a phrase which has long annoyed me—that of Ashley Montagu (1962) to the effect that “man has lost virtually all of his instincts.”

He then deals with various aspects of territorial behavior, integrating the infor-



mation we have on the maintenance of territorial boundaries, the displays associated with this, the various kinds of territories which may be seen in the animal kingdom, and the function of territory both as a place to breed and an area from which food can be gathered, and as a means of dispersing the individuals of a population over the available habitat so that there is optimum benefit for the population as a whole. This means that, in some species, under certain conditions, a number of individuals will not breed. But it is the population which is served in such cases, not the individual, and here we may have the evolutionary beginnings of what we know as altruism in man. This is not the place to consider the various theories of territory—anyone interested should read the book. But it is the place to reiterate the underlying conviction of all these books that the key to the future lies in our evolutionary past. As Ardrey puts it, "The continuity of human evolution from the world of the animal to the world of man ensures that a human group in possession of a territory will behave according to the universal laws of the territorial principle. What we call patriotism, in other words, is a calculable force which, released by a predictable situation, will animate man in a manner no different from other territorial species." There can be no doubt that this is basically true. Just as a territory-owning stickleback or herring gull will fight its neighbors more fiercely the farther they venture into its territory, so does a football team fight the more courageously the nearer to its line it is pressed, and the academic more jealously protect his inner office than his institution. The football team is illustrating territorial defense, and the academic the use of territory as a place where one has minimal competition with others.

So far I have indicated that the value of Ardrey's work lies in his integration of

important facts, and his belief in the underlying importance of evolutionary mechanisms. Now I am pleased to point out what may be a lasting contribution to science: his descriptive analysis of the kinds of social organization which he calls the "noyau" and the "nation."

The term "noyau" is taken from the French ethologist Jean-Jacques Petter (1962) "as a label for the society of inward antagonism," and implies "a primitive evolutionary step towards societies characterized by mutual aid." On the island of Madagascar live thirty-odd species of lemurs—presimian primates—which provide the biologist with a tantalizing store of evolutionary information. Most of the species are diurnal and have normal societies of mutual aid and cooperation, but the nocturnal "sportive lemur" is interestingly different. This species "defends a territory of no more than sixty or so yards in diameter. A little society of six or so may crowd itself into an area as small as an acre, where it will live in perfect recrimination." And yet there will be no others of the species for miles around. Why do they stay together? The answer, of course, is a complex one, but it will certainly be connected with the previous observation of James Fisher (1954) who wrote that the effect of this kind of behavior "is to create 'neighborhoods' of individuals who while masters of their own definite and limited properties are bound firmly and *socially* to their next-door neighbors by what in human terms would be described as a dear-enemy or rival-friend situation, but which in bird terms should more safely be described as mutual stimulation." This is reminiscent of Wynne-Edwards' "brotherhood of tempered rivalry."

The biological "nation," as Ardrey defines it, is "a social group containing at least two mature males which holds as an

exclusive possession a continuous area of space, which isolates itself from others of its kind through outward antagonism, and which through joint defense of its social territory achieves leadership, cooperation, and a capacity for concerted action." It matters not whether such a nation be composed of a few or of many individuals, or whether we consider true lemurs, howler monkeys, Bushman bands, Greek city states, or modern human nations. The social principle seems to be the same.

As Ardrey sees it, Italy, with its communal noise, argument, and general strife, is a noyau. Britain, with its general calm—natural or inhibited—is a nation. There is much to be said for, and against, both. What is important here is that two major kinds of human social organization seem to have been mapped out more than fifty million years ago, when the older noyau-type lemurs produced nation-type offshoots. How near the truth was the Chinese saying, "There is all animal in man, though there is not all man in the animal!"

In my first paragraph I noted that the operations of specialists can be a stumbling-block to progress: ". . . no specialist is entitled to observe or interpret anything that might seem the province—or *territory!*—of another specialist. Ultimately this is traceable to a craving for dominance hierarchies." This is a quotation, not from Ardrey, but from the Russells' book. *Human Behavior—A New Approach* is so encyclopedic in content and so erudite in presentation that one hesitates even to attempt to deal with it in less than full review. However, it does knit extremely well with the other books here reviewed, the four together showing how ethology can be applied to the fundamental problems of life with a potential of success perhaps unequalled by any other discipline. Like Ardrey, the Russells show due regard to

the work of Lorenz as an outstanding scientist. Also like Ardrey, they acknowledge our debt to Niko Tinbergen, who has done more for ethology than anyone but Lorenz. His publications of 1951, 1953, and 1965 show the scope of both his mind and his subject.

The Russells bring an impressive battery of qualifications to bear upon the study of human behavior. Claire Russell is a psychiatrist of great experience, and W. M. S. Russell, who has also practiced as a psychiatrist, began his career with scholarships in Greek and in classics and English literature at Oxford before becoming a successful zoologist and writer. He has published widely in ethology, and his *Evolutionary Concepts in Behavioral Science* (1958, 1959, 1961) is definitive. The Russells' background means that they have had access to animal and human behavior in the laboratory and consulting room, and in the vast collection of behavioral description contained in classical and contemporary literature. They have used their opportunities well.

The value of the Russells' contribution is threefold. First, they demonstrate the evolutionary origins of human behavior in ways which complement and supplement the writings of Ardrey and Lorenz. Secondly, they show how the approaches of ethology and psychiatry can be used together in the analysis of human behavior, both in life and in literature. And thirdly, they make a biological investigation of those behavioral qualities which we do *not* share with the other animals—"that capability and god-like reason," as Hamlet called it, or what is widely but loosely referred to as "intelligence." It is this third section of the book which is most important for our present context.

As the Russells point out, the widely-accepted IQ tests, whatever their sophisti-

cation, do not deal successfully with that specifically human capability which separates us behaviorally from our evolutionary ancestors. It is perhaps not generally realized that a person's score in certain standard IQ tests is almost completely unaffected by cutting off the oxygen supply to the brain for a considerable period (Halstead, 1947) or by removal of both frontal lobes of the brain or of any other lobe on one side (Hebb, 1942; Halstead, 1947). These tests thus indicate that a person with up to a third of the cerebrum missing—even the frontal cortex which is the most specifically human part of the brain—is as intelligent as when the brain is intact. Clearly, such tests are inaccurate indicators of "intelligence" if we assume brain structure and function to have evolved together.

The first *biological* approach to the problem of intelligence was made by Ward Halstead (1947), who set out to measure the activities of the brain as a progressive evolutionary machine. As he has said elsewhere (1951), "Man's strategic position in the animal kingdom derives in part at least from the unusual range and quality of the perceptions of which he is capable, from his capacity for controlled adaptability, and from the degrees of freedom through which orientation can be achieved and maintained." The Russells point out that this constant ability to rearrange and reorganize is a fundamental of an evolutionary machine—"An evolutionary machine is made up of a very large number of component units, richly interconnected, the relations between which are not predetermined. As various inputs impinge upon the machine, the small units become linked together into larger transient combinations, which shift and merge in kaleidoscopic fashion, like political parties in the parliamentary assemblies of some modern countries. The question may therefore arise, which of these transient

functional groupings will survive as larger single components and this may depend on a process of selection. The process is thus comparable with the natural selection of successful organisms and species in the grand procession of organic evolution, and we can apply to events in the individual brain all the principles observed on that more spacious stage." I think this evolutionary point is well taken, and I shall refer to it again.

Halstead's technique was to apply a battery of tests designed with the evolutionary concept in mind to a wide range of subjects, including patients with brain lesions as well as normal individuals, and then to submit the mass of resulting data to factor analysts. These experts postulated the operation of four factors for the production of the results they were given. Further investigation of these factors (e.g., Reitan, 1956) indicates not only what kind of ability they subserve, but also their connection with the most recently evolved part of the human brain—the cortex of the prefrontal lobes.

The Russells have named Halstead's factors *abstraction*, *integration*, *specific expression*, and *exploratory drive*. These names reflect the modes of behavior which appear to be the overt expression of the four intelligence factors, and together they indicate the structure of biological intelligence. If biological intelligence is—as I believe—true intelligence, then it behooves us to take due note of its structure and function, and study the causes and results of its breakdown. Herein lies the major contribution of this book.

The *abstraction* factor involves the ability to recognize a unit in a mass, as when we note a black sheep in a flock, or a different behavioral or chemical reaction from those to which we are accustomed. It enables us to discriminate among a large number of

objects, people, or situations; to see the individual in a crowd, and the wood as well as the trees. Lorenz has remarked that this is just what we mean by "intuition"—literally being able to "see into" a situation.

The *integration* factor is probably the most important factor of biological intelligence, being the most specifically human factor of the four. In fact, if it is as important as the Russells' evidence suggests, it may be the skeleton key to unlock the doors to individual fulfillment, group achievement, and, in the long run, human survival. It would seem to be a progressive evolutionary machine *par excellence*.

Integration involves the assessment of units of information brought in by abstraction. It "permits *new data to be compared with old*, and thus makes it possible to *qualify a generalization*." The more efficient the operation of the integration factor, the greater the understanding of information received. "Integration is the organized but flexible growth of the individual's experience; a growth like that of 'poetry' which, as T. S. Eliot once pointed out, changes its whole nature every time a new poem is written. It hinges on a complete availability of all data, old and new, for comparison with each other and rearrangement in ever more realistic groupings." A high level of integration must be strongly connected with having an open mind—"indeed the phrase is peculiarly appropriate, implying as it does both receptiveness to new ideas and an open system of communications within." It is also connected with a sense of humor which, "as has often been said, is a sense of the incongruous. It requires a capacity to put two ideas in juxtaposition—especially two of one's own ideas, or one's own preaching and one's own practice—and see how absurdly they clash. The sense of humor is a sort of feedback report on the state of integration of our experience, or that of

our society." Primed with this indispensable report, we can proceed, in the words of Dr. Johnson, "to clear our minds of cant."

The *specific expression* factor is easily recognized. Terms describing it are in everyday use: "green fingers," "a greasy thumb," "the gift of the gab," "a light hand with pastry." The overt expression of intelligence always involves the use of some particular skill or skills, this varying considerably from one person to another. A high degree of specific expression is equivalent to what is usually called "flair" or "talent," while high degrees of abstraction and integration produce genius. The intelligence factors vary independently, doubtless under the influence of both heredity and upbringing, the result of which is that one may encounter a genius with little talent, or someone with a definite flair but low general intelligence.

*Exploratory drive* brings us new information for abstraction and integration. When very highly developed, this factor produces the eminent explorer—geographical, scientific, artistic, or whatever; but all the time it is that which keeps us aware of our immediate environment. And to explore is to tolerate uncertainty; to be aware that the current situation may change. This is important in all human endeavor: "The gift that makes the supreme explorer, the scientist or artist, is not the capacity to frame a hypothesis or a mode of expression, but the capacity resolutely to scrap them and start again—not, of course, really from scratch, for a good scientific hypothesis is always integrated into its successor as a special case, and an artist makes fresh use of the devices he has discarded as such."

The intelligence factors, of course, form an intimately linked system. "In setting up our internal models, abstraction is important, and in permitting their free interplay integration is vital. The exploratory drive pro-

vides a ceaseless influx of new variability, which is filtered and organized into meaningful patterns by the other factors."

Now why is all this so important? The answer is a simple one. If the Russells are right—and I believe they are—biological intelligence is the most highly developed manifestation of the general evolutionary process of adaptive modification by information feedback (Russell, 1961, has called this "combinatorial selection"). This involves the development of numerous variations in the population, whether it be a population of genes or of organisms, and the feeding back of useful variations into the basic pool—which thus benefits as a whole by the experience of individual members. Clearly, a process of integration is essential to this procedure and when it breaks down the consequences may be serious. When a species, for example, becomes so specialized that it cannot adapt to changing circumstances, then change will be harmful. Similarly, when the free flow of information in the intelligence system is interfered with by deficiencies in the internal or external environment, the individual shows proportionally irrational, automatic, and nonadaptive behavior. The result is varying degrees of isolation, rigidity, stereotypy, and compulsiveness—the exact opposites of the free information flow, flexibility, versatility, and freedom of choice seen in biological intelligence. I believe that these malfunctions have been at least partially operative in the negative reactions to Darwin and to Lorenz; in the delay of what Ardrey calls "the contemporary revolution" in natural science; and in the schisms of the "two cultures." And they are as common in Academe as elsewhere.

The potential contribution of ethology to the problem of human conflict is thus clear. By acceptance of the basic facts of life—those of evolution—ethological techniques

clear the way for a true understanding of the behavior of animals, including man. By integrating with other natural sciences, particularly neurophysiology and psychology, ethology can speed the analysis of the more significant behavioral processes such as biological intelligence. And by an ethological study of the breakdown of these processes we may be able to correct the mistakes of the present and avoid making so many in the future. The four books here reviewed give a composite picture of this potential. If their message is jammed by too much "noise" in the system, we may as well fall back on that supreme rationalization of Thurber's bad Duke: "We all have faults; mine is being wicked."

## REFERENCES

- ALSOP, J. "The Way of an Aggressor," *The New Yorker*, Sept. 10, 1966.
- BARNETT, S. A. "On the Hazards of Analogies between Human Aggression and Aggression in Other Animals," *Scientific American*, Jan. 1967.
- DARWIN, C. R. *Journal of Researches*. London, 1839.
- . *The Origin of Species*. London, 1859.
- DRIVER, P. M. "An Ethological Approach to the Problem of Mind." In W. Corning (ed.), *The Mind: Physical and Biological Approaches to its Function*. (In press.)
- FISHER, JAMES. "Evolution and Bird Sociality." In J. Huxley *et al.*, *Evolution as a Process*. London, 1954.
- GOODHALL, J. "Tool-using and Aimed Throwing in a Community of Free-Living Chimpanzees," *Nature*, 201 (1964), 1264–66.
- GORER, G. "Man Has No Killer Instinct," *New York Times Magazine*, Nov. 27, 1966.
- HALL, K. R. L., and G. B. SCHALLER. "The Tool-Using of the California Sea Otter (*Enhydra lutris nereis*)," *J. Mammal.*, 45: 287, 1964.
- HALDANE, J. B. S. "Introducing Douglas Spalding," *British Journal of Animal Behavior*, 2, 1 (1954), 1–11.
- HALSTEAD, W. C. *Brain and Intelligence*. Chicago, 1947.

- . "Brain and Intelligence." In L. A. Jeffress (ed.), *Cerebral Mechanisms in Behavior*. New York, 1951.
- HEBB, D. O. "The Effect of Early and Late Brain Injury upon Test Scores, and the Nature of Normal Adult Intelligence," *Proceedings of the American Philosophical Society*, 85 (1942), 275-92.
- HOWARD, H. E. *Territory in Bird Life*. London, 1920.
- KOESTLER, A. "Of Geese and Men," *The Observer* (London), Sept. 18, 1966.
- LACK, DAVID. *Darwin's Finches*. London, 1947.
- LORENZ, K. Introduction to Phoenix Edition of *The Expression of the Emotions* by Charles Darwin. Chicago, 1965.
- MEAD, M. Review of "On Aggression" in *Redbook Magazine*, Nov. 1966.
- MONTAGU, M. F. ASHLEY. *Culture and the Evolution of Man*. New York, 1962.
- PETTER, J.-J. "L'Écologie et l'Éthologie des Lémuriens Malgaches," *Mémoires du Muséum National d'Histoire Naturelle* (Paris), 27, 1 (1962).
- REITAN, R. M. "Investigation of Relationships between 'Psychometric' and 'Biological' Intelligence," *Journal of Nervous and Mental Disease*, 123 (1956), 536-41.
- RUSSELL, W. M. S. "Evolutionary Concepts in Behavioral Science. I: Cybernetics, Darwinian Theory, and Behavioral Science," *General Systems*, 3 (1958), 18-28.
- . "Evolutionary Concepts in Behavioral Science. II: Organic Evolution and the Genetical Theory of Natural Selection," *General Systems*, 4 (1959), 45-74.
- . "Evolutionary Concepts in Behavioral Science. III: The Evolution of Behavior in the Individual Animal and the Principle of Combinatorial Selection," *General Systems*, 6 (1961), 51-94.
- SCHNEIRLA, T. C. "Instinct and Aggression," *Natural History*, 85, 10 (1966).
- SLOBODKIN, L. B. "On the Present Incompleteness of Mathematical Ecology," *American Scientist*, 53 (1965), 347-57.
- THORPE, W. H. "Ethology and Consciousness." In J. C. Eccles (ed.), *Brain and Conscious Experience*. Springer-Verlag, 1966.
- TINBERGEN, N. *The Study of Instinct*. Oxford, 1951.
- . *The Herring Gull's World*. London, 1953.
- . *Social Behaviour in Animals*. (2nd edn.) London, 1965.
- VAN LAWICK-GOODHALL, J., and H. VAN LAWICK-GOODHALL. "The Use of Tools by the Egyptian Vulture, *Neophron percnopterus*," *Nature*, 212 (1966), 1468-69.
- WALSHE, F. M. R. "The Brain-Stem Conceived as the 'Highest Level' of Function in the Nervous System," *Brain*, 80 (1957), 510-39.
- WHEELER, W. M. "A Neglected Factor in Evolution," *Science*, N.S., 15, 385 (1902), 766-74.
- WHITE, G. *The Natural History and Antiquities of Selbourne in the County of Southampton*. London, 1798.
- WYNNE-EDWARDS, V. C. *Animal Dispersion in Relation to Social Behavior*. Edinburgh, 1962.
- ZUCKERMAN, S. "The Human Beast," *Nature*, 212 (1966), 563-64.