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The Selfish Gene

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Why are people?

Intelligent life on a planet comes of age when it first works out the reason for its own existence. If superior creatures from space ever visit earth, the first question they will ask, in order to assess the level of our civilization, is: 'Have they discovered evolution yet?' Living organisms had existed on earth, without ever knowing why, for over three thousand million years before the truth finally dawned on one of them. His name was Charles Darwin. To be fair, others had had inklings of the truth, but it was Darwin who first put together a coherent and tenable account of why we exist. Darwin made it possible for us to give a sensible answer to the curious child whose question heads this chapter. We no longer have to resort to superstition when faced with the deep problems: Is there a meaning to life? What are we for? What is man? After posing the last of these questions, the eminent zoologist G. G. Simpson put it thus: 'The point I want to make now is that all attempts to answer that question before 1859 are worthless and that we will be better off if we ignore them completely.'*

Today the theory of evolution is about as much open to doubt as the theory that the earth goes round the sun, but the full implications of Darwin's revolution have yet to be widely realized. Zoology is still a minority subject in universities, and even those who choose to study it often make their decision without appreciating its profound philosophical significance. Philosophy and the subjects known as 'humanities' are still taught almost as if Darwin had never lived. No doubt this will change in time. In any case, this book is not intended as a general advocacy of Darwinism. Instead, it will explore the consequences of the evolution theory for a particular issue. My purpose is to examine the biology of selfishness and altruism.

Apart from its academic interest, the human importance of this subject is obvious. It touches every aspect of our social lives, our loving and hating, fighting and cooperating, giving and stealing, our

greed and our generosity. These are claims that could have been made for Lorenz's *On Aggression*, Ardrey's *The Social Contract*, and Eibl-Eibesfeldt's *Love and Hate*. The trouble with these books is that their authors got it totally and utterly wrong. They got it wrong because they misunderstood how evolution works. They made the erroneous assumption that the important thing in evolution is the good of the *species* (or the group) rather than the good of the individual (or the gene). It is ironic that Ashley Montagu should criticize Lorenz as a 'direct descendant of the "nature red in tooth and claw" thinkers of the nineteenth century . . .'. As I understand Lorenz's view of evolution, he would be very much at one with Montagu in rejecting the implications of Tennyson's famous phrase. Unlike both of them, I think 'nature red in tooth and claw' sums up our modern understanding of natural selection admirably.

Before beginning on my argument itself, I want to explain briefly what sort of an argument it is, and what sort of an argument it is not. If we were told that a man had lived a long and prosperous life in the world of Chicago gangsters, we would be entitled to make some guesses as to the sort of man he was. We might expect that he would have qualities such as toughness, a quick trigger finger, and the ability to attract loyal friends. These would not be infallible deductions, but you can make some inferences about a man's character if you know something about the conditions in which he has survived and prospered. The argument of this book is that we, and all other animals, are machines created by our genes. Like successful Chicago gangsters, our genes have survived, in some cases for millions of years, in a highly competitive world. This entitles us to expect certain qualities in our genes. I shall argue that a predominant quality to be expected in a successful gene is ruthless selfishness. This gene selfishness will usually give rise to selfishness in individual behaviour. However, as we shall see, there are special circumstances in which a gene can achieve its own selfish goals best by fostering a limited form of altruism at the level of individual animals. 'Special' and 'limited' are important words in the last sentence. Much as we might wish to believe otherwise, universal love and the welfare of the species as a whole are concepts that simply do not make evolutionary sense.

This brings me to the first point I want to make about what this book is *not*. I am not advocating a morality based on evolution.* I am saying how things have evolved. I am not saying how we humans

morally ought to behave. I stress this, because I know I am in danger of being misunderstood by those people, all too numerous, who cannot distinguish a statement of belief in what is the case from an advocacy of what ought to be the case. My own feeling is that a human society based simply on the gene's law of universal ruthless selfishness would be a very nasty society in which to live. But unfortunately, however much we may deplore something, it does not stop it being true. This book is mainly intended to be interesting, but if you would extract a moral from it, read it as a warning. Be warned that if you wish, as I do, to build a society in which individuals cooperate generously and unselfishly towards a common good, you can expect little help from biological nature. Let us try to *teach* generosity and altruism, because we are born selfish. Let us understand what our own selfish genes are up to, because we may then at least have the chance to upset their designs, something that no other species has ever aspired to.

As a corollary to these remarks about teaching, it is a fallacy—incidentally a very common one—to suppose that genetically inherited traits are by definition fixed and unmodifiable. Our genes may instruct us to be selfish, but we are not necessarily compelled to obey them all our lives. It may just be more difficult to learn altruism than it would be if we were genetically programmed to be altruistic. Among animals, man is uniquely dominated by culture, by influences learned and handed down. Some would say that culture is so important that genes, whether selfish or not, are virtually irrelevant to the understanding of human nature. Others would disagree. It all depends where you stand in the debate over 'nature versus nurture' as determinants of human attributes. This brings me to the second thing this book is not: it is not an advocacy of one position or another in the nature/nurture controversy. Naturally I have an opinion on this, but I am not going to express it, except insofar as it is implicit in the view of culture that I shall present in the final chapter. If genes really turn out to be totally irrelevant to the determination of modern human behaviour, if we really are unique among animals in this respect, it is, at the very least, still interesting to inquire about the rule to which we have so recently become the exception. And if our species is not so exceptional as we might like to think, it is even more important that we should study the rule.

The third thing this book is not is a descriptive account of the detailed behaviour of man or of any other particular animal species. I

shall use factual details only as illustrative examples. I shall not be saying: 'If you look at the behaviour of baboons you will find it to be selfish; therefore the chances are that human behaviour is selfish also'. The logic of my 'Chicago gangster' argument is quite different. It is this. Humans and baboons have evolved by natural selection. If you look at the way natural selection works, it seems to follow that anything that has evolved by natural selection should be selfish. Therefore we must expect that when we go and look at the behaviour of baboons, humans, and all other living creatures, we shall find it to be selfish. If we find that our expectation is wrong, if we observe that human behaviour is truly altruistic, then we shall be faced with something puzzling, something that needs explaining.

Before going any further, we need a definition. An entity, such as a baboon, is said to be altruistic if it behaves in such a way as to increase another such entity's welfare at the expense of its own. Selfish behaviour has exactly the opposite effect. 'Welfare' is defined as 'chances of survival', even if the effect on actual life and death prospects is so small as to *seem* negligible. One of the surprising consequences of the modern version of the Darwinian theory is that apparently trivial tiny influences on survival probability can have a major impact on evolution. This is because of the enormous time available for such influences to make themselves felt.

It is important to realize that the above definitions of altruism and selfishness are *behavioural*, not subjective. I am not concerned here with the psychology of motives. I am not going to argue about whether people who behave altruistically are 'really' doing it for secret or subconscious selfish motives. Maybe they are and maybe they aren't, and maybe we can never know, but in any case that is not what this book is about. My definition is concerned only with whether the *effect* of an act is to lower or raise the survival prospects of the presumed altruist and the survival prospects of the presumed beneficiary.

It is a very complicated business to demonstrate the effects of behaviour on long-term survival prospects. In practice, when we apply the definition to real behaviour, we must qualify it with the word 'apparently'. An apparently altruistic act is one that looks, superficially, as if it must tend to make the altruist more likely (however slightly) to die, and the recipient more likely to survive. It often turns out on closer inspection that acts of apparent altruism are really selfishness in disguise. Once again, I do not mean that the

underlying motives are secretly selfish, but that the real effects of the act on survival prospects are the reverse of what we originally thought.

I am going to give some examples of apparently selfish and apparently altruistic behaviour. It is difficult to suppress subjective habits of thought when we are dealing with our own species, so I shall choose examples from other animals instead. First some miscellaneous examples of selfish behaviour by individual animals.

Blackheaded gulls nest in large colonies, the nests being only a few feet apart. When the chicks first hatch out they are small and defenceless and easy to swallow. It is quite common for a gull to wait until a neighbour's back is turned, perhaps while it is away fishing, and then pounce on one of the neighbour's chicks and swallow it whole. It thereby obtains a good nutritious meal, without having to go to the trouble of catching a fish, and without having to leave its own nest unprotected.

More well known is the macabre cannibalism of female praying mantises. Mantises are large carnivorous insects. They normally eat smaller insects such as flies, but they will attack almost anything that moves. When they mate, the male cautiously creeps up on the female, mounts her, and copulates. If the female gets the chance, she will eat him, beginning by biting his head off, either as the male is approaching, or immediately after he mounts, or after they separate. It might seem most sensible for her to wait until copulation is over before she starts to eat him. But the loss of the head does not seem to throw the rest of the male's body off its sexual stride. Indeed, since the insect head is the seat of some inhibitory nerve centres, it is possible that the female improves the male's sexual performance by eating his head.* If so, this is an added benefit. The primary one is that she obtains a good meal.

The word 'selfish' may seem an understatement for such extreme cases as cannibalism, although these fit well with our definition. Perhaps we can sympathize more directly with the reported cowardly behaviour of emperor penguins in the Antarctic. They have been seen standing on the brink of the water, hesitating before diving in, because of the danger of being eaten by seals. If only one of them would dive in, the rest would know whether there was a seal there or not. Naturally nobody wants to be the guinea pig, so they wait, and sometimes even try to push each other in.

More ordinarily, selfish behaviour may simply consist of refusing

to share some valued resource such as food, territory, or sexual partners. Now for some examples of apparently altruistic behaviour.

The stinging behaviour of worker bees is a very effective defence against honey robbers. But the bees who do the stinging are kamikaze fighters. In the act of stinging, vital internal organs are usually torn out of the body, and the bee dies soon afterwards. Her suicide mission may have saved the colony's vital food stocks, but she herself is not around to reap the benefits. By our definition this is an altruistic behavioural act. Remember that we are not talking about conscious motives. They may or may not be present, both here and in the selfishness examples, but they are irrelevant to our definition.

Laying down one's life for one's friends is obviously altruistic, but so also is taking a slight risk for them. Many small birds, when they see a flying predator such as a hawk, give a characteristic 'alarm call', upon which the whole flock takes appropriate evasive action. There is indirect evidence that the bird who gives the alarm call puts itself in special danger, because it attracts the predator's attention particularly to itself. This is only a slight additional risk, but it nevertheless seems, at least at first sight, to qualify as an altruistic act by our definition.

The commonest and most conspicuous acts of animal altruism are done by parents, especially mothers, towards their children. They may incubate them, either in nests or in their own bodies, feed them at enormous cost to themselves, and take great risks in protecting them from predators. To take just one particular example, many ground-nesting birds perform a so-called 'distraction display' when a predator such as a fox approaches. The parent bird limps away from the nest, holding out one wing as though it were broken. The predator, sensing easy prey, is lured away from the nest containing the chicks. Finally the parent bird gives up its pretence and leaps into the air just in time to escape the fox's jaws. It has probably saved the life of its nestlings, but at some risk to itself.

I am not trying to make a point by telling stories. Chosen examples are never serious evidence for any worthwhile generalization. These stories are simply intended as illustrations of what I mean by altruistic and selfish behaviour at the level of individuals. This book will show how both individual selfishness and individual altruism are explained by the fundamental law that I am calling *gene selfishness*. But first I must deal with a particular erroneous explanation for altruism, because it is widely known, and even widely taught in schools.

This explanation is based on the misconception that I have already mentioned, that living creatures evolve to do things 'for the good of the species' or 'for the good of the group'. It is easy to see how this idea got its start in biology. Much of an animal's life is devoted to reproduction, and most of the acts of altruistic self-sacrifice that are observed in nature are performed by parents towards their young. 'Perpetuation of the species' is a common euphemism for reproduction, and it is undeniably a *consequence* of reproduction. It requires only a slight over-stretching of logic to deduce that the 'function' of reproduction is 'to' perpetuate the species. From this it is but a further short false step to conclude that animals will in general behave in such a way as to favour the perpetuation of the species. Altruism towards fellow members of the species seems to follow.

This line of thought can be put into vaguely Darwinian terms. Evolution works by natural selection, and natural selection means the differential survival of the 'fittest'. But are we talking about the fittest individuals, the fittest races, the fittest species, or what? For some purposes this does not greatly matter, but when we are talking about altruism it is obviously crucial. If it is species that are competing in what Darwin called the struggle for existence, the individual seems best regarded as a pawn in the game, to be sacrificed when the greater interest of the species as a whole requires it. To put it in a slightly more respectable way, a group, such as a species or a population within a species, whose individual members are prepared to sacrifice themselves for the welfare of the group, may be less likely to go extinct than a rival group whose individual members place their own selfish interests first. Therefore the world becomes populated mainly by groups consisting of self-sacrificing individuals. This is the theory of 'group selection', long assumed to be true by biologists not familiar with the details of evolutionary theory, brought out into the open in a famous book by V. C. Wynne-Edwards, and popularized by Robert Ardrey in *The Social Contract*. The orthodox alternative is normally called 'individual selection', although I personally prefer to speak of gene selection.

The quick answer of the 'individual selectionist' to the argument just put might go something like this. Even in the group of altruists, there will almost certainly be a dissenting minority who refuse to make any sacrifice. If there is just one selfish rebel, prepared to exploit the altruism of the rest, then he, by definition, is more likely

than they are to survive and have children. Each of these children will tend to inherit his selfish traits. After several generations of this natural selection, the 'altruistic group' will be over-run by selfish individuals, and will be indistinguishable from the selfish group. Even if we grant the improbable chance existence initially of pure altruistic groups without any rebels, it is very difficult to see what is to stop selfish individuals migrating in from neighbouring selfish groups, and, by inter-marriage, contaminating the purity of the altruistic groups.

The individual-selectionist would admit that groups do indeed die out, and that whether or not a group goes extinct may be influenced by the behaviour of the individuals in that group. He might even admit that *if only* the individuals in a group had the gift of foresight they could see that in the long run their own best interests lay in restraining their selfish greed, to prevent the destruction of the whole group. How many times must this have been said in recent years to the working people of Britain? But group extinction is a slow process compared with the rapid cut and thrust of individual competition. Even while the group is going slowly and inexorably downhill, selfish individuals prosper in the short term at the expense of altruists. The citizens of Britain may or may not be blessed with foresight, but evolution is blind to the future.

Although the group-selection theory now commands little support within the ranks of those professional biologists who understand evolution, it does have great intuitive appeal. Successive generations of zoology students are surprised, when they come up from school, to find that it is not the orthodox point of view. For this they are hardly to be blamed, for in the *Nuffield Biology Teachers' Guide*, written for advanced level biology schoolteachers in Britain, we find the following: 'In higher animals, behaviour may take the form of individual suicide to ensure the survival of the species.' The anonymous author of this guide is blissfully ignorant of the fact that he has said something controversial. In this respect he is in Nobel Prize-winning company. Konrad Lorenz, in *On Aggression*, speaks of the 'species preserving' functions of aggressive behaviour, one of these functions being to make sure that only the fittest individuals are allowed to breed. This is a gem of a circular argument, but the point I am making here is that the group selection idea is so deeply ingrained that Lorenz, like the author of the *Nuffield Guide*, evidently did not realize that his statements contravened orthodox Darwinian theory.

I recently heard a delightful example of the same thing on an otherwise excellent B.B.C. television programme about Australian spiders. The 'expert' on the programme observed that the vast majority of baby spiders end up as prey for other species, and she then went on to say: 'Perhaps this is the real purpose of their existence, as only a few need to survive in order for the species to be preserved'!

Robert Ardrey, in *The Social Contract*, used the group-selection theory to account for the whole of social order in general. He clearly sees man as a species that has strayed from the path of animal righteousness. Ardrey at least did his homework. His decision to disagree with orthodox theory was a conscious one, and for this he deserves credit.

Perhaps one reason for the great appeal of the group-selection theory is that it is thoroughly in tune with the moral and political ideals that most of us share. We may frequently behave selfishly as individuals, but in our more idealistic moments we honour and admire those who put the welfare of others first. We get a bit muddled over how widely we want to interpret the word 'others', though. Often altruism within a group goes with selfishness between groups. This is a basis of trade unionism. At another level the nation is a major beneficiary of our altruistic self-sacrifice, and young men are expected to die as individuals for the greater glory of their country as a whole. Moreover, they are encouraged to kill other individuals about whom nothing is known except that they belong to a different nation. (Curiously, peace-time appeals for individuals to make some small sacrifice in the rate at which they increase their standard of living seem to be less effective than war-time appeals for individuals to lay down their lives.)

Recently there has been a reaction against racialism and patriotism, and a tendency to substitute the whole human species as the object of our fellow feeling. This humanist broadening of the target of our altruism has an interesting corollary, which again seems to buttress the 'good of the species' idea in evolution. The politically liberal, who are normally the most convinced spokesmen of the species ethic, now often have the greatest scorn for those who have gone a little further in widening their altruism, so that it includes other species. If I say that I am more interested in preventing the slaughter of large whales than I am in improving housing conditions for people, I am likely to shock some of my friends.

The feeling that members of one's own species deserve special moral consideration as compared with members of other species is old and deep. Killing people outside war is the most seriously-regarded crime ordinarily committed. The only thing more strongly forbidden by our culture is eating people (even if they are already dead). We enjoy eating members of other species, however. Many of us shrink from judicial execution of even the most horrible human criminals, while we cheerfully countenance the shooting without trial of fairly mild animal pests. Indeed we kill members of other harmless species as a means of recreation and amusement. A human foetus, with no more human feeling than an amoeba, enjoys a reverence and legal protection far in excess of those granted to an adult chimpanzee. Yet the chimp feels and thinks and—according to recent experimental evidence—may even be capable of learning a form of human language. The foetus belongs to our own species, and is instantly accorded special privileges and rights because of it. Whether the ethic of 'speciesism', to use Richard Ryder's term, can be put on a logical footing any more sound than that of 'racism', I do not know. What I do know is that it has no proper basis in evolutionary biology.

The muddle in human ethics over the level at which altruism is desirable—family, nation, race, species, or all living things—is mirrored by a parallel muddle in biology over the level at which altruism is to be expected according to the theory of evolution. Even the group-selectionist would not be surprised to find members of rival groups being nasty to each other: in this way, like trade unionists or soldiers, they are favouring their own group in the struggle for limited resources. But then it is worth asking how the group-selectionist decides *which* level is the important one. If selection goes on between groups within a species, and between species, why should it not also go on between larger groupings? Species are grouped together into genera, genera into orders, and orders into classes. Lions and antelopes are both members of the class Mammalia, as are we. Should we then not expect lions to refrain from killing antelopes, 'for the good of the mammals'? Surely they should hunt birds or reptiles instead, in order to prevent the extinction of the class. But then, what of the need to perpetuate the whole phylum of vertebrates?

It is all very well for me to argue by *reductio ad absurdum*, and to point to the difficulties of the group-selection theory, but the

apparent existence of individual altruism still has to be explained. Ardrey goes so far as to say that group selection is the only possible explanation for behaviour such as 'stotting' in Thomson's gazelles. This vigorous and conspicuous leaping in front of a predator is analogous to bird alarm calls, in that it seems to warn companions of danger while apparently calling the predator's attention to the stotter himself. We have a responsibility to explain stotting Tommies and all similar phenomena, and this is something I am going to face in later chapters.

Before that I must argue for my belief that the best way to look at evolution is in terms of selection occurring at the lowest level of all. In this belief I am heavily influenced by G. C. Williams's great book *Adaptation and Natural Selection*. The central idea I shall make use of was foreshadowed by A. Weismann in pre-gene days at the turn of the century—his doctrine of the 'continuity of the germ-plasm'. I shall argue that the fundamental unit of selection, and therefore of self-interest, is not the species, nor the group, nor even, strictly, the individual. It is the gene, the unit of heredity.* To some biologists this may sound at first like an extreme view. I hope when they see in what sense I mean it they will agree that it is, in substance, orthodox, even if it is expressed in an unfamiliar way. The argument takes time to develop, and we must begin at the beginning, with the very origin of life itself.