Broom, D.M. 2006. The evolution of morality. ***Applied Animal Behaviour Science.***, 100, 20-28.

Pre-publication copy

The Evolution of Morality

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Abstract

Complex animal societies are most successful if members minimise harms caused to one another and if collaboration occurs. In order to promote this, a moral structure inevitably develops. Hence morality has evolved in humans and in many other species. The attitudes which people have towards other humans and individuals of other species are greatly affected by this biologically–based morality. The central characteristic of religions is a structure which supports a moral code, essentially the same one in all religions. A key obligation to others is to help to promote their good welfare and to avoid causing them to have poor welfare. Human views as to which individuals should be included in the category of those to whom there are moral obligations have broadened as communication and knowledge have progressed. Many people would now include, not only all humans but sentient animals, e.g. vertebrates and cephalopods, as well. Amongst sentient animals, coping with adversity may be more difficult in those with less sophisticated brain processing.

1. Concepts and attitudes

Morality is not an obscure topic which is difficult to comprehend. *Something is moral if it pertains to right rather than wrong* (Broom 2003). Every person has ideas about what is right and some actions are considered to be right by a very high proportion of people. People take account of morality in their actions and most discuss moral issues with others. *Ethics is the study of moral issues*. Is morality an issue related to biology and are there links between the functioning of humans and non-humans in relation to decisions about which actions to carry out because they are moral and which to avoid because they are not?

There are many ideas which biologists would take as axiomatic but which other people do not necessarily accept. The arguments presented by biologists can lead to conclusions which are initially regarded as surprising by some members of the general public but

which may well come to be more widely accepted as time goes on. One example of such a biologically-based statement, which seems entirely normal to all biologically trained people but which is not part of normal thinking for many people even now, is that humans are animals . Another is that the organ involved in decision-making in humans and other animals is their brain and that the heart is not directly involved in decision making. These and many other biological facts are relevant to the discussions about the biological basis of morality which are presented here.

The topic of morality is one which some people would not accept as suitable for discussion, from a biological or other perspective, because it is thought of as sacred or God-given. The influential philosopher G.E. Moore (1903) went so far as to state that: "It is illegitimate to argue from the facts of nature to human values". Even a biologist might regard morality as in some way outside biology. In the midst of a strong argument about the importance of evolution by natural selection in social life, Dawkins (1976) said: "We, alone on earth, can rebel against the tyranny of the selfish replicators". Somewhat similar views are stated by Alexander (1979) and Williams (1988).

The idea of the "selfish gene" proposed by Richard Dawkins was embedded in a very illuminating and influential book which promoted the understanding of genetic and behavioural mechanisms. However, the term itself is misleading. *Selfish describes an individual acting in a way which increases its fitness at the expense of the fitness of one or more other individuals whilst being aware of the likely affects on itself and on the harmed individual or individuals* (Broom2003). The word selfish is thus limited to individuals and it could not describe a gene. If there is no awareness, it is not selfishness. As Midgley (1994) points out, a word which is widely used with one set of connotations cannot be transferred to another set without causing the reader or hearer to misunderstand either the breadth of its implications or the concept itself. One consequence of Dawkins' usage of "selfish gene" is that people will argue that we are not responsible for the effects of our genes, genes are often selfish, and hence there is nothing wrong with being selfish. It would be better to produce another term to refer to genes that promote the fitness of the bearer, i.e. the actions benefit the subject, at the expense of others that are harmed by the action. The terms "harmful subject-benefit" (Broom 2003), or "subject-benefit at the expense of others", are more accurate if more cumbersome.

The desirability of considering the biological basis for morality has been expounded by many authors, for example Kropotkin (1902), Kummer (1978), de Waal (1996) and

Ridley (1996). Wilson (1975) said: "the time has come for ethics to be removed temporarily from the hands of philosophers and biologicized". The idea that consideration of the biological basis of morality is at odds with the concept of humans being able to take important ethical decisions, was criticised by Midgley (1978): "The notion that we 'have a nature', far from threatening the concept of freedom, is absolutely essential to it. If we were genuinely plastic and indeterminate at birth, there is no reason why society should not stamp us into any shape which might suit it".

In order to explain the basis for morality we often refer to altruism. An *altruistic* act by an individual is one which involves some cost to that individual in terms of reduced fitness but increases the fitness of one or more other individuals. Trivers (1985) said: "There can hardly be any doubt that reciprocal altruism has been an important force in human evolution". *Reciprocal altruism* occurs when an altruistic act by A directed towards B is followed by some equivalent act by B directed towards A or by an act directed towards A whose occurrence is made more likely by the presence or behaviour of B.

Although altruistic actions may spring to the mind of many people when the term morality is used, what else do people think of? The response of some people is to assume that sexual activity is being discussed. However, a major confusion exists in the usage of the term morality to refer especially to aspects of sexual activity. There are some sexual and other actions, which might be criticised by many in human society, but which are to do with customs rather than with true morality. Many sexual taboos serve a mate-guarding function for certain males rather than being in the general interest of the members of a social group. A straightforward example is the view that it is morally wrong for women to derive pleasure from the act of copulation. The practice of clitorectomy is a consequence of this view.

There are actions which are always wrong, in my view, so they cannot be justified by cost-benefit analysis of consequences. However, I consider that sexual acts are not in themselves wrong. The consequentialist argument is useful here in that moral judgements about sexual activity should concern whether or not there are harms to individuals as a consequence of the acts (Broom 2003). Hence, whilst rape would always be immoral because it would always have harmful effects, no sexual act would necessarily be immoral. . It is necessary to consider the context of the act, including the individual to which it is addressed, and its consequences in order to determine whether or not there are

harms as a result of the act. Indeed, some sexual acts result in the production of much desired offspring, help to cement bonds between partners, or calm individuals and reduce the risk of anti-social behaviour.

Codes and rules of conduct, which include issues of great importance, are widespread in human society. Some of these codes are specified as laws, for example those to prevent murder, theft, rape and fraud. Other selfish acts are the subject of sanctions which, although social rather than legal, are important nonetheless. Indeed Ridley (1996) refers to a taboo against selfishness. Codes of conduct have been written down in many societies, for example the ten commandments of the Jews and Christians in the Bible (Exodus, 20, 3-17 and Deuteronomy, 5, 7-21) and the Greek rules of conduct. The Qu'ran makes it clear that it is the morality of the individual's actions which determines reward and punishment (Sura XLIV, 40).

Society condemns, albeit to different degrees: those who injure another deliberately, those who cause injury by careless contact with another such as a push which leads to a head injury, and those who are negligent with the consequence that an injury is caused to another, for example leaving a large hole in the ground uncovered in the dark or giving a child a dangerous weapon. There might be circumstances in which the extent of condemnation by a section of society is reduced, for example the view of killing during war. However, even in this circumstance, some killing is not accepted.

There are also rules relating to the use of important resources. If plentiful quantities of food are occasionally obtained by individuals in a social group, there is likely to be an expectation within the group that these will be shared. Many of these rules seem to exist in other social species.

2. Cooperation and cheating

Humans and other animals which live in social groups cooperate in many ways which benefit the cooperating individuals more than would occur if they just competed with one another. Those who have watched stable groups of cattle, horses or various primate species will have observed allogrooming. The individual groomed will often, at a later time, groom the groomer. In all species, some body areas are difficult for the individual itself to groom efficiently and, where mutual grooming occurs, ecto-parasite infestation tends to be less. Benham (1982,1984) describes mutual grooming relationships in

unrelated cows in suckler herds which spend much time together and seldom show aggression to one another.

There are many ways in which individuals can gain more food by responding to or collaborating with others. Broom (1981) lists joining others who are likely to have found food; observing others in order to find food sources or learn how to acquire food; collaborating in hunting for, acquiring, handling and defending food or avoiding depleted sources; sharing food; and giving food to others. A vulture soaring over the plains of Africa or a pied wagtail joining a post-roost gathering gains useful information about the location of food from conspecifics (Ward and Zahavi 1973, Broom et al, 1976). Wolves hunt more effectively in packs, pelicans move in formation and synchronise scooping for fish, and crocodiles hold prey while another crocodile grasps and twists its body to remove flesh. In all of these actions, the individuals gain by collaborating but there is a potential for cheating. The sharing of food by vampire bats, ravens and chimpanzees (Wilkinson 1984, Heinrich 1989, Savage-Rumbaugh and Lewin 1994) is clearly reciprocal altruism. The characteristics of shared foods are summarised by de Waal (1996) as follows:

- " Highly valued and concentrated put prone to decay.
- Too much for a single individual to consume.
- Unpredictably available.
- Produced through skills and strengths that made certain classes of individuals dependent on others for access.
- Most effectively procured through collaboration".

Cooperation is also necessary in the production and defence of communal nests by weaver birds, termites and ants. Indeed in the social insects and in naked mole rats the feeding environment is partly produced by social collaboration. The edifices produced by ants, termites and humans are valuable means of environmental control.

Defence against predators is more effective in many social species because of collaboration. House sparrows will sit chirping on a fence or branch until they can move safely *en masse* into a feeding area (Elgar 1986). Alarm calls when a predator is detected often draw attention to the caller but also help to maintain group stability. Terns in a colony may collaborate by diving onto and pecking an intruder which would not be repelled by the actions of a single tern. Fieldfares will dive on intruders and defecate on

them with similar effect. Vigilance in flocks and herds, often with sharing of responsibility for doing so, benefits the vigilant individual when it is reciprocated and because group stability is promoted. Communication about danger may be more sophisticated. Savage-Rumbaugh and Lewin (1996) reported walking in woodland with a bonobo and dogs. A large feline potential predator was detected in a tree. On their return, the bonobo vocalised to five other bonobos. The researcher also talked to the bonobos. When two of these bonobos that had not previously detected the feline predator next went to that area of woodland they showed signs of being frightened.

In addition to the more obvious kinds of cooperation, the commonest kind of altruistic behaviour in social groups, which is often reciprocated, is to avoid injuring other individuals (Broom 2003). Great care is usually taken by individuals to avoid collisions, which would benefit the avoider as well as the avoided, but also not to step on others, or injure them with horns or teeth, or push others out of trees, or over cliffs, or into places of danger from predators. If any accidental and perhaps avoidable harm to another does occur, this can be followed by changed behaviour on the part of the harmed individual and on the part of the one who has harmed. Harm may be followed by some form of retribution but either accidental or deliberate harm may also be followed by reconciliation, at least in primates (de Waal 1996). The individuals which take part in reconciliation may form alliances in order to achieve social and other objectives.

Once altruism occurs and is reciprocated, the possibility of cheating becomes important. A variety of characteristics of individuals, any of which would tend to promote altruistic and moral behaviour is listed in Table 1. Amongst these are ways of detecting and responding to individuals who cheat, in that they fail to avoid harming others or make no effort to reciprocate to an individual or contribute in a more general way with in a group if benefit is received.

Table 1 Individual characteristics which may promote altruistic or moral behaviour

1.	Affection for certain types of individuals, perhaps those which are close relatives or group members, or are likely to be, which reduces the chances that harm will be done to them.
2.	Affection for those same individuals which increases the likelihood of carrying out behaviour which is beneficial to them.
3.	Ability to recognise individuals which might be beneficiaries or benefactors.

4. Ability to remember the actions of others which resulted in benefit to oneself or to others in the group.

5. Ability to remember one's own actions which resulted in a benefit to another individual.

6. Ability to assess risk or benefit of own and other actions and either to compare these or to avoid high risk and try to attain high benefit.

7. Ability to detect and evaluate cheating.

8. Ability to punish or facilitate the punishment of those who cheat.

9. Ability to support a social structure which encourages cooperation and discourages cheating.

10. Having a desire to conform.

(based on Broom 2003)

The characteristics listed in Table 1 are discussed further in Section 4. Feelings are important parts of the mechanisms which individuals need in order to cope with the various problems of life.

3. Selection and Altruism

A key question in relation to morality and its evolution is whether or not genes which promoted cooperative, altruistic behaviour would be out-competed by those which promoted ~~harmful~~ subject benefit at the expense of others. Would a gene which promoted altruistic behaviour spread in a population of a social species? Dawkins (1979) said that gene U (Universal)– altruistic to every other individual would lose out to a gene K (Kin)– altruistic to kin but never to others. However, altruism is not universal, it has limits. In the following argument (Broom 2003), other possible strategies resulting from genes are considered, firstly in the situation where there is reciprocation and secondly in the situation where there is not.

A gene U^R leads to the bearer being altruistic except where the bearer's monitoring shows that it is inadvisable because reciprocation is unlikely. With a gene $K(U^R)$ the bearer is altruistic to kin and also to others if monitoring shows that reciprocation is likely. Either of these might out-compete K.

A further aspect of this argument is that U^R might be relatively more successful in a population in which many of those benefited also carried U^R. A similar argument is relevant for $K(U^R)$. U^R is likely to be more successful because it would increase the stability of the social group and hence benefit the bearers of U^R.

In the circumstance where no reciprocation occurs, another possible strategy, linked to the gene U^* would involve being altruistic with no reciprocation necessary but with monitoring which allows recognition of X (bearers always competitive) or K when bearers are not interacting with kin. U^* could spread if its effects promoted group stability and hence the bearers of U^*. It may be concluded that genes promoting altruism in defined circumstances are likely to be successful in social species. Also, such genes are likely to be old and to be present in all social species in which individual recognition is possible.

Game theory has been used by several authors in order to try to explain whether strategies which are altruistic could be as successful as strategies which promote personal gain whatever the effect on others. One model is the prisoner's dilemma in which two individuals may either co-operate, or defect and betray one another, for specified pay-offs. Several different strategies have been tried and the strategy which was most successful was "tit-for-tat" in which the individuals: begin by co-operating and then do what the opponent had last done (Ridley 1996). However, as Kitcher (1993) and Axelrod (1997) have pointed out, there are problems with using such game theory results. In general they are too simple when the sophisticated intellects of any social vertebrate are considered. In order to understand how altruistic behaviour might have evolved, it is necessary to incorporate into modelling some information obtained from studies of real life situations. Riolo et al (2001) found that tolerance and cooperation in a group-living species could arise from a strategy involving benevolence to individuals bearing a recognisable characteristic that is the same as one borne by the actor. This could occur even if there was no direct reciprocation.

4. Capabilities needed to show moral behaviour

In order to behave in a moral way, i.e. in a way that results in at most avoidance of harm to others and that may lead to benefit to others and to the stability of the social group, animals need to have brain function which allows some degree of recognition, awareness, decision-making and feelings (Barton and Dunbar 1997). There must be social living for a long enough time. Many studies of social behaviour include implied evidence for individual recognition, for example, in vervet monkeys (Cheney and Seyfarth 1990). Experimental studies with cattle (Hagen and Broom 2003) show that they can be trained to approach one individual rather than another in order to gain a food reward. Kendrick et al (2001) found: that sheep could be trained to discriminate between individual

conspecifics and individual humans. In these animals, specific cells in the medial temporal and pre-frontal cortex fire when a particular face is seen, and the same cells fire and the same behavioural discrimination occurs 8-12 months later. Other aspects of cognitive ability relevant to the development of moral behaviour have been demonstrated in many animals. Most of the literature on non-humans is on primates (Harcourt 1992, Byrne 1995, Lee 1999, Heyes and Huber 2000). In a study of sheep in alpine pastures, Favre (1975) found that flocks led by an old ewe would graze a pasture and then avoid revisiting it until about 30 days later, by which time it had regrown. Many non-human species would appear to be capable of some degree of awareness, as defined and categorised by Sommerville and Broom (1998), complex decision making and a variety of feelings (Broom 1998). An indication of the possible awareness of own actions and functioning comes from the studies of Hagen and Broom (2004) on young cattle. The heifers were put in a pen whose gate could be opened by pressing a panel with the nose, thus giving access to food 15m away. They learned to do this and at the time of learning showed an excitement response of increased heart rate and jumping or galloping. This "Eureka" effect was not shown by controls which just gained access to the reward or by heifers which had learned earlier how to open the gate.

In order that an individual behaves in a moral way, there must be an appropriate motivational system. Motivational state is the sum of the states of a set of causal factors and the mechanisms which give rise to these will have evolved like any other biological mechanism (Broom 1981). The evolution of morality will therefore depend substantially on the evolution of the motivational system. The higher brain processes which are used when using all available information to make complex decisions will be a very important aspect of the biological processes underlying morality.

5. Morality and its evolution

The key points of the arguments presented here about morality and its evolution and elaborated by Broom (2003) are as follows.

1. Morality is defined. True morality does not include customs, or attitudes to sexual behaviour stemming from mate guarding etc., except indirectly by effect.

2. Laws may indicate what is morally right but may protect the persons and property of the powerful or perpetuate tribal or other customs. Although more likely to do so in a democracy, laws will not always indicate what is right.

3. There is widespread occurrence of co-operative and altruistic behaviour in social animals.

4. Awareness, feelings and cognitive ability are clearly demonstrated in mammals, birds and other animals to a lesser extent.

5. There is great overlap in the gene complement of humans and other animals which suggests that any genes that promote moral actions are not likely to be unique to humans..

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6. The likely success of strategies that involve moral action is demonstrated by modelling and the actual success is apparent from behavioural and other observation.

7. Reciprocal altruism is important in the evolution of morality but is not all of the biological basis. Some actions which do not harm, or which directly benefit others, are not reciprocal but are directed towards individuals who need help and who have not previously provided benefit to the actor. Such actions may make a contribution to the stability of the social group.

6. The moral core of religion

A religion is a system of beliefs and rules which individuals revere .and respond to in their lives and which are seen as emanating directly or indirectly from some intangible power (Broom 2003). All religions have a moral code that is central to their functioning. The differences among religions are in peripheral aspects, including tribal components. Holy books are a source of information about what is moral but they also include much history. Religions have a guide to behaviour and a system for discouraging cheats or those who harm others. The moral code in each religion is very similar and includes a

variety of commandments used by those who adhere to the religion.

7. What does the biological basis for morality tell us about our treatment of humans and other animals?

Moral actions are directed more towards those identified as "us" than towards those considered to be "them". The most limited category of "us"(a) includes only individuals readily recognised as close relatives. A wider range of individuals is included (b) if "all of those who know who I am" is the category. Still wider is the group (c) who "might have access to the same information that I have" or (d) "all sentient beings who share characteristics with me". *A sentient being is one that has some ability: to evaluate the actions of others in relation to itself and third parties, to remember some of its own actions and their consequences, to assess risk, to have some feelings and to have some degree of awareness*. Increased communication efficiency is revolutionising our degree of concern for other humans and extending our area of moral concern. For many humans who own pets, category (a) will include companion animals. Serpell and Paul (1994) found that many pet owners stated that they regarded their pets as part of their family. Whether or not they do so, most pet owners would include their pet in category (b). As scientific knowledge about animal functioning advances and the media presents ever more information about the sophisticated abilities of many animals, the number of people who include non-humans in the category of "sentient beings who share characteristics with me" increases. In many societies now, education levels are high and there is easy access to good quality information about people in other countries and about animals whose abilities are complex. Hence the likelihood will decline that people will cause, or tolerate poor welfare in foreign people or animals perceived to be aware. Closely allied with this is a desire to help individuals who are disadvantaged for some reason such as being subject to a natural disaster, or a disease outbreak, or a famine. Similarly, animals used by man are more likely to be helped, or at least harmed less. It is of particular interest that changed attitudes to animals appear to be linked more closely with the education level of people than to their affluence. In countries which are relatively poor, but well educated, interest in animal welfare may be such that people are willing to incur some degree of financial loss rather than benefit from poor welfare in animals.

The idea that humans have a relatively broad view as to which individuals, human or not, should be helped in some circumstances may have parallels in other species. There are

many accounts of animals which seem to have formed inter-specific friendships and which help one another. Groups of individuals who collaborate may sometimes include two or more species. For example, this is evident in tropical bird flocks. Although there are many examples of inter-specific competition, the nature of inter-specific interactions is not always competitive.

If we use a living animal in a way which gives us some benefit, we have an obligation to that animal. The nature of the obligation is affected by the level of awareness of which the animal is capable. One obligation is to avoid causing poor welfare in the animal except where to do so would lead to net benefit to that animal, or to other animals including humans, or to the environment,. A utilitarian approach is not sufficient to determine all obligations, however, and a deontological approach is also needed because there are some degrees of poor welfare which are never justified by benefit to others. It is my view (Broom 2003, p 130) that all human behaviour and laws should be based on the obligations of each person to act in an acceptable way towards each other person and to each animal that is used. It is better to base strategies for living on our obligations rather than to involve the concept of rights. Many so-called rights can result in harm to others.

The most widely accepted obligation to animals which we use concerns avoidance of poor welfare so learning about animal welfare and its scientific basis is very important for all who have frequent contact with animals.

The link between level of awareness and welfare is complex. Welfare concerns how well individuals are able to cope with good or bad environments (Broom and Johnson 1993). Some animals, for example, Protozoa, seem not to have any awareness and would not be called sentient. Animals which are sentient would have a wider array of ways in which their welfare could be poor, because the complexity of their brain function is above a threshold level, than non-sentient animals. We should be concerned about the welfare of all animals and more concerned about those that are sentient, for example all vertebrates and cephalopod molluscs. However, within this category of sentient animals, more sophisticated brain processing will provide better opportunities for coping with some problems. There seem to be means of dealing with pain which humans have but fish do not. As a consequence, a certain degree of pain may cause worse welfare in fish than in humans (Broom 2001). This argument would also be valid for other causes of poor welfare. It also seems likely that more complex brains allow more possibilities for pleasure, which contributes greatly to good welfare. The same type of human action may

sometimes be more cruel if inflicted on a simpler animal than on a human or other more complex animal.

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