Setting the Scene

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Some years ago, I took part in a late night, 'bear-pit' style television debate on the rights and wrongs of fishing. My role was to present scientific evidence as to whether fish can experience pain and fear. In brief, the evidence shows they can. After I had outlined the results of this work, a member of the audience got up and said 'This is all rubbish. These scientists don't know what they are talking about. I have been fishing all my life and I know for certain that fish don't feel anything'. He then added 'What sort of fish were they anyway? and when I said 'carp' he said: 'Ah well, carp are clever buggers'. These four words encapsulate the need for this book. We sort of assume animals have minds. We may even think we understand the meaning of sentience but most of us don't give it much thought, because, for most of us, most animals don't much matter.

This book is written for those for whom it matters a lot. My central aim is to equip you to seek a better understanding of the minds of sentient animals. To this end, it will not only give an outline review of existing knowledge relating to the mental processes that determine animal behaviour and welfare but also offer suggestions and guidance on how to approach subjects where we know little or have been relying on easy preconceptions. Those of us who embark on the scientific study of animal welfare, their needs, their behaviour and their motivation, are cautioned to avoid the fallacy of anthropomorphism: the fallacy of ascribing human characteristics to other animals. However,

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I suggest at the outset, that it is valid to apply a principle of reverse anthropomorphism that asks not 'how would this chicken, cow, horse' feel if it were me but how would I feel if I were one of them?' As we shall see, thought experiments based on the principle of reverse anthropomorphism provide the basis for most studies in motivation analysis.

This voyage into the minds of sentient minds is going to be quite a journey. The nature of sentience is far too complex to be encapsulated within a one-line definition, such as 'the capacity to experience feelings'. Chapter 2 examines in detail the meaning and nature of consciousness and the sentient mind within the animal kingdom. To keep this enquiry as simple as possible, I shall consider the animal mind almost entirely as an abstract concept, within the brain and powered by the brain (mostly), but as an intangible compendium of information bank, instruction manual, filter and digital processor of incoming sensations and information. It is not too far-fetched to make the analogy with the digital computer and describe the brain as the hardware and the mind as the software. The neurophysiology involved in driving the hardware has its own beauty, but that is another story.

Through evolution by natural selection, animals have acquired behavioural skills appropriate to their design (phenotype) and natural environment. All animals are equipped at birth with a basic set of mental software: instructions genetically coded as a result of generations of adaptation to the physical and social challenges of the environments in which they evolved. This, which I shall hereafter refer to as their mental birth-right, is instinctive and hard wired. In some species that we may define as primitive, their responses to stimuli may always be restricted to invariant, hard-wired, preprogrammed responses to sensations induced by environmental stimuli. According to one's definition, this alone may be sufficient to classify them as sentient. However, throughout the animal kingdom, from the octopus to the great apes, we find overwhelming evidence of species that exhibit sentience to a higher degree. They build on this instinctive birthright and develop their minds. They learn to recognise, interpret and memorise new experiences in the form of feelings, good, bad or indifferent, and develop patterns of behaviour designed to promote their wellbeing measured, in all cases, in terms of primitive needs such as the relief of hunger and pain and, within the deeper, inner circles of sentience, feelings of companionship, comfort and joy. The ability to operate on the basis of knowledge acquired from experience, rather than pure instinct, enriches the physical and mental skills the sentient animal can recruit to cope with the challenges of life and promote an emotional sense of wellbeing. It also carries the potential for suffering when coping becomes too difficult.

The physical and mental skills and resources present at birth are those acquired through adaptation of their ancestors to the ancestral environment, because these were the skills that mattered the most. Animals that demonstrate deeper degrees of sentience have the capacity to develop these inborn, instinctive skills throughout their lifetime and teach these new skills to subsequent generations. Differing demands of differing environments mean that each species exhibits a portfolio of skills most appropriate to their special needs. It follows that, in our eyes, individual species may appear to be brilliant at some things and dumb at others. Raptor birds that hunt by day develop an exquisite visual ability to locate their prey whereas bats that hunt at night use radar based on ultrasound. The albatross can navigate its way home to its nest across the

barren expanses of the Southern Ocean but will fail to recognise its chick if it has blown out of the nest. Domestication distorts the process of natural selection in two ways. We compel these animals to adapt to an environment largely determined by us, and this may be very different from that of their ancestors. We also introduce the entirely unnatural business of breeding: we tinker with the physical and mental phenotype of our animals to suit our needs for food, fashion, recreation or unqualified love.

We cannot observe animals through our eyes and conclude that any one species is better, or more highly developed than another. Each species adapts to meet its own special needs and the skills required to meet these needs vary in their nature and complexity. Pigs are good at being pigs, sheep are good at being sheep. Rats are very good at being rats because they have had to develop the physical and mental skills necessary for survival in a complex and frequently hostile environment. Sharks are very good at being sharks but, because they have thrived for millennia in a food-rich, stable environment, they have never really had to think. Many dogs are not very good at being dogs because they have not had the chance to grow up in an environment of dogs.

Human Attitudes to Animals

Most of this book is devoted to an exploration of the minds of sentient animals, their feelings, thoughts and motivation to behaviour seen so far as possible, through their own eyes. Human attitudes to animals would be irrelevant were it not for the fact that our actions, based on our attitudes, can have such a profound effect on their lives. In an earlier book, 'Animal Welfare: A Cool Eye towards Eden' (76) I wrote '*Man has dominion over the animals whether we like it or not. Wherever we share space on the planet, and this includes all but the most inaccessible regions of land, sea and air, it is we that determine where and how they shall live. We may elect to put a battery hen in a cage or establish a game reserve to protect the tiger but in each case the decision is ours, not theirs. We make a pet of the hamster but poison the rat. These human decisions are driven by the same incentives that motivate non-human animals since they reflect the will of us as individuals and as a species to survive and achieve a sense of well-being. We need good food and we seek highly nutritious eggs at little cost. We need good hygiene and seek to remove rats that carry germs. We choose to provide for our pets in sickness and in health because they enrich the lives of us and our children. We admire the tiger not only for its fearful symmetry but as a symbol of freedom itself, so we offer it more freedom than we give the laying hen. However, in either case it is impossible to escape the conclusion that both are living on our terms*.'

The history of human attitudes to animals (and to other humans) is awash with ignorance and inhumanity. The European Judeo-Christian belief was inscribed in Genesis as '*every beast of the earth and every fowl of the air. . .I have given for meat*'. The attitude of other religions to non-human animals varies. Of the Eastern religions, Taoism and Buddhism recognise the sentience of our fellow mortals and treat them with respect. More of this later. So far as I can gather, Confucianism regards non-human animals as commodities or tools, and therefore 'off the page' so far as philosophy is concerned. Islam and Judaism display rituals of respect for their food animals at the point of slaughter but these bring no comfort to the conscious animal while it bleeds to

death. The Hindu veneration of the Holy Cow is driven more by fear of divine retribution than any concern for animal welfare.

The French philosopher Rene Descartes (1596–1650) sought to justify the Judeo-Christian attitude by asserting that humans are fundamentally different from all other animals because we alone possess mind, or consciousness. His notorious phrase *Cogito ergo sum* – I think, therefore I am – further implied *non cogitant ergo non sunt* – they don't think therefore they aren't. He saw non-human animals as automata, equivalent to clockwork toys, and thereby provided an 'ethical' basis for treating them simply as commodities on the assumption that it is not possible to be cruel to animals because they lack the capacity to suffer. His view may appear to us as totally lacking in any understanding of animals. However, he was not alone. For most of history, the moral concepts of right and wrong were applied only to intentions and actions within the human species. The utilitarian, Jeremy Bentham (1748–1832) was an exception when he wrote of animals 'the question is not can they reason. . .. *but can they suffer?*'. The supreme challenge to this limited concept of morality came from Albert Schweitzer who wrote '*the great fault of all ethics hitherto has been that they believed themselves to have to deal only with the relations of man to man. In reality, the question is what is his attitude to the world and all that comes within his reach*'. This became the basis for his principle of reverence for life (10).

The last Century has seen a steady progression of the evolution of morality into law. The UK Protection of Animals Act (1911) made it an offence to '*cause unnecessary suffering by doing or omitting to do any act*' (59). The 1997 Treaty of Amsterdam acknowledged that '*since animals are sentient beings, members should pay full regard to the welfare requirements of animals*' (73). The UK Animal Welfare Act (2006) imposed a duty of care on responsible persons to provide for the basic needs of their animals (both farmed animals and pets) (25). This act signified a considerable advance, since it is no longer necessary to prove that suffering has occurred, it is only necessary to establish that animals are being kept or being bred in such a way that is liable to cause suffering. These proscriptive laws are written in broad terms, which gives them the flexibility to deal with a range of specific circumstances. However, they beg several questions: 'what constitutes suffering, especially *necessary* suffering? 'what *are* the welfare requirement of animals?', and (above all) 'what is meant by sentience?' One of the main aims of this book is to guide all those directly and indirectly involved in matters of animal welfare (which means almost everybody) towards a deeper understanding of the complex biological and psychological properties of animal minds that determine their perception and their behaviour, thus determining the principles that should govern our approach to their welfare.

Despite the evidence of progress in the law relating to the protection of animals, there is still too much evidence of cruelty, both deliberate and mindless. Deliberate cruelty is a crime punishable by law and relatively rare. Mindless cruelty is far more common. It reflects a mindset conditioned by ignorance or training to the assumption that animals are automata, thus incapable of suffering. We are constantly presented with images of abuses to animals from all over the world. I cite only three examples.

A few years ago, Compassion in World Farming (CIWF) released a shocking video of behaviour in a small abattoir. Lambs for slaughter were hung up by driving a hook through their legs behind the Achilles tendon prior to stunning and having their throats

cut. In this video, four lambs were hung on hooks and left to struggle while the slaughterman went off to smoke a cigarette. From the lambs' perspective, this was cruelty in the extreme. I suggest, however, that from a human perspective this may not have been deliberate cruelty but an extreme case of mindlessness. It had never occurred to him, or been explained to him, that sentient animals are capable of suffering. If he had been really cruel, he would have watched.

My most extreme personal experience of the mindless ill-treatment of animals came from a large commercial pig abattoir in Beijing. Pigs transported to the abattoir in crates had been gaffed by the neck and hauled out of their crates on long poles like inert sacks of corn. This was not only appallingly cruel, to our eyes, but spectacularly counterproductive because the pigs fought them every inch of the way. The Bristol team designed a humane handling system whereby the pigs were able to move out of the vehicles and down a well-designed passage at their own speed with minimal stress and human interference. The abattoir owners were delighted with this new system because they were able to reduce the number of staff needed to 'handle' the pigs by over 50%.

These two instances of mindless ill-treatment may be attributed to ignorance. However, ill-treatment on an industrial scale, carried out with the approval of the highest authorities, remains a problem in the so-called developed world and to the present day. The number of chickens killed and consumed by humans *every day* is approximately 70 million. Furthermore, most of them are unlikely to experience much that could be quality of life before they die. In the words of Ruth Harrison, the godmother of the Animal Welfare movement: '*If one person is unkind to one animal, it is considered as cruelty but when a lot of people are unkind to a lot of animals, especially in the name of commerce, the cruelty is condoned and, once large sums of money are at stake, will be defended to the last by otherwise intelligent people*' (29). It was Ruth who pointed out the absurdity of the UK Protection of Birds Act (1964) which required any caged bird to be given enough space to flap its wings but then stated *'provided this subsection does not apply to poultry'*. This subsection meant that, at the time, the Act did not apply to about 99% of caged birds. This is perhaps the most egregious example of the fallacy of classifying animals as commodities in term of their utility to us, rather than as sentient beings whose minds have been shaped by their genetic inheritance and their individual experience of life. It was sustained public pressure generated by pioneers like Ruth Harrison that compelled the European Union to pronounce in the Treaty of Amsterdam that '*Members shall, since animals are sentient beings, pay full regard to the welfare requirements of animals*' (73). This is a clumsy sentence from a clumsy clause that is also littered with caveats and exceptions for regional and religious practices. Nevertheless, it did recognise in law the principle that animals used by us for food, scientific enquiry, or health and safety legislation should not be considered simply as commodities but treated with respect and concern for their wellbeing.

Animal Behaviour Science

This exploration of the minds of sentient animals draws heavily on scientific studies of animal psychology and behaviour. The scientific investigation of animal behaviour is concentrated on two main themes. The first is the study of how animals behave in their

natural habitat. This can establish their behavioural needs and the actions they perform to meet these needs. From this, we can build up a reasonably comprehensive picture of the resources (e.g. diet, physical and social environment) they require to achieve a sense of physical and mental wellbeing. With this information to hand, we can devise management policies that seek to address these needs whenever we modify their natural habitat to suit our own needs for food, companionship, sport, safety or scientific endeavour.

The second approach is to present animals with a set of questions relating to their perceived needs and measure their responses. This is the science of motivation analysis (16). The simplest version of this approach is the *Preference Test*. In a typical experiment, the animal is given a choice, e.g. between two foods or two environments and invited to demonstrate a preference. The choice may be between options that we guess might create more or less satisfaction (e.g. two types of bedding material for pigs), or between options that may be more or less aversive (e.g. barren vs. enriched cages for hens). One classic approach is to place the animal in a T maze that allows it to choose between the two options of taking the path to the right or the left. This can tell us quite a lot. Pet food manufacturers may discover flavours preferred by cats (although cats are fickle creatures). Designers of enriched environments for intensively reared pigs or chickens can get some idea of the fixtures and fittings that these animals appear to favour or avoid. However, preference tests can sometimes reveal evidence to indicate that the scientist and the experimental animals are not thinking the same way. In one such experiment, mice were asked to choose between two environments deemed by the scientist to be more or less enriched by traversing a narrow tunnel between the two. Most mice chose to spend the majority of time in the tunnel. For them, this was better than either of the choices on offer (66). The scientists had assumed the mice would choose on the basis of comfort, whereas, in their minds, we must assume that the primary need was for a sense of security. The scientists posed a specific question to these mice and got an unexpected answer. It was the wrong question, but they had a better understanding of mice as a result.

The main limitation of the preference test is that it makes no distinction between choices that are trivial and those that really matter. A more advanced approach to motivation analysis is to measure the strength of motivation by how hard an animal is prepared to work to get a reward in the form of a pleasant experience such as food, or relief from an unpleasant experience such as cold, pain, isolation, or a barren environment (16,45). Examples of the currency used to measure cost include the number of times the animal has to press a lever, or the amount of pressure it has to exert on a gate to obtain the reward. Specific rewards are ranked as more or less price elastic or price inelastic. Most animals, unless satiated, will continue to work for a food reward as the price is increased, which makes it price inelastic. The marginal reward of a different lying surface, e.g. straw vs. wood shavings may be price elastic: i.e. not worth too much effort. While the preference test can do no more than establish behavioural priorities, motivation analysis can determine how much these things matter.

The aim of motivation analysis is to devise tests that enable an animal (e.g. a rat or chicken) to demonstrate, by way of its actions, how it feels about the challenge with which it is faced, positive, negative, or indifferent. Having demonstrated that the test animal is motivated to act to receive a specific reward such as food or avoid a potentially

unpleasant experience such as isolation or confinement, the scientist then measures the price the animal is prepared to pay to improve its welfare. They observe this behaviour, review the results in the light of current understanding as already described in the scientific 'literature' and form conclusions based on evidence as to the preferences and strength of motivation of the animal. This will be set out for publication in words, tables and diagrams. The scientist has used the medium of language to describe conclusions and decisions that arose first in the mind of the rat or chicken in order that other humans might better understand how it feels to be that chicken. This is reverse anthropomorphism, pure and simple.

There is another profound conclusion to be drawn from studies such as these; one that is key to our understanding of the minds of our fellow mortals. Presented with a specific question, which can be quite complex, the rat or chicken has analysed the problem, worked out a satisfactory response and memorised the actions necessary to achieve that response without recourse to the uniquely human medium of the spoken and written language. Moreover, as we shall see later, the ability to solve simple problems set by scientists in the laboratory can be a very limited measure of an animal's mental capacity. It pales into insignificance when set, for example, alongside the detailed large-scale maps that a pigeon needs to carry in its head if it is to navigate its way home. Animals with sentient minds have the ability to acquire and retain a great deal of knowledge and understanding without the need for language as we understand it nor reference to external banks of information stored in libraries and/or Google. What is more, these animals may be able to convey this understanding to their offspring, i.e. to engage in the process of education. We are only just beginning to understand the capacity of non-human animals to develop thought without language and convey these thoughts to others, but it is an ability worthy of the greatest respect.

Rules of Engagement

Two main themes run throughout this exploration of the minds of sentient animals.

Theme 1: *The needs of a sentient animal are defined entirely by its own physical and emotional phenotype, its environment and its education, and these are independent of our own definition of the animals as:*

Wild: subsets, game, (e.g. fox) vermin (rat), protected (badger)

Domestic: subsets, pet (dog), farm (pig), sport (horse)

In 'A Cool Eye towards Eden' I illustrated this theme with a picture of a brown rat in a larder. (Figure 1.1). I wrote at the time: '*A normal reaction to the brief glimpse of a rat in one's larder would be horror or, at least, a cold resolve to destroy the rat as quickly as possible, together with any others who happen to be around. Now study the picture more carefully. The rat is not only sleek to the point of being chubby but completely unalarmed by the flash photography, totally at ease in human company and altogether charming. Her name is Cordelia*'. Once we give the rat a name we provoke a shift in attitude. Nevertheless, Cordelia was a rat, and a rat is a rat, whether we classify it as laboratory animal, vermin or pet. She adapted wonderfully well to an enriched environment with loving human contact (my adult daughter, also an academic). If she had grown up in the company of other rats in the wild, she would have adapted equally

Figure 1.1 Cordelia at play. (from Webster, 1994)

well to that and, in the interests of her own survival, become fearful and dangerous in the presence of humans. If she had spent most of her life isolated in a barren laboratory cage, she would have had limited opportunity to develop her mind through lack of experience and thus be unable to handle complex decisions such as how to reconcile fear and curiosity in the presence of a novel stimulus. However, the essence of the rat mind is the same, whatever its circumstances. We have no right to assume that some rats are more equal than others. The behavioural and emotional needs of any sentient animal are determined by its own sentience, and these are entirely independent of our perception of its lovability, palatability, utility or nuisance value. In the case of wild animals, be they rats, badgers or, indeed, elephants, there are valid reasons ranging from human health to sustainable management of habitat to operate a form of population control. However, the principle of respect for all life directs that this should be as humane as possible. Where there is no clear need for population control, the policy for wild animals should be to leave them well and leave them alone. The most humane approach to the sensitive and sustainable management of wild animals is to preserve their natural habitat and stay out of their way.

Theme 2: *It is an anthropocentric fallacy to assume that the greater the similarity of an animal species to the human species, the more intelligent they are and the more worthy they are of our concern and respect.*

It is in our human nature to express most concern for the animals that look and appear to behave most like us. We are conditioned to believe that humans are the most intelligent of the animal species, so assume that animals that evolved in ways most similar to us must rank second. Thus, not only in popular opinion but also in legislation we give more rights to primates than to pigs. The anthropocentric fallacy was well recognised by Darwin and is implicit in the title of his seminal work 'The *Descent* (not the

Ascent) of Man'. To give just one illustration of the flaw in this argument, corvid birds (e.g. crows) are better at problem solving than chimpanzees. Much more of this anon. However, this argument based simply on the basis of problem-solving skills is, like all arguments based on selected evidence, far too simplistic. I shall seek to persuade you that it is pointless to claim that one animal species is more intelligent than another. Each sentient animal is born with, and further develops the mindset and skills most appropriate to its needs and these needs are defined by the environment to which it must adapt. When we seek to measure the intelligence of animals according to criteria that we humans would define as measures of intelligence, such as the ability to associate symbols with boxes that contain food rewards, we may conclude that the most advanced of non-human animals can just about match the intelligence of a three-year-old child. When we start to wonder about the skills that animals display in relation to things that matter to them, but which we cannot measure in the laboratory, like navigating the world, we can only conclude that, in some respects, their skills may be superhuman. These two themes crystallise into one single, central message. Our respect for, and actions towards, all species of sentient animals should be based on our best possible understanding of their life as they see it, not as we see it. In matters of human respect for animals, the question '*What is this animal for?*' has no meaning.

The essence of this book is an exploration of animal sentience: how it is determined by, and how it adapts to the physical and mental challenges of the specific environments to which they are exposed. Part 1, The Sentient Mind, skills and strategies, first explores the nature of sentience itself, how animals are motivated primarily by their feelings and the implications this has for their survival, success and wellbeing. It then examines the special senses, vision, hearing and olfaction, and the capacity of the mind to construct mental formulations based on information provided by the special senses and, from this, acquire knowledge and understanding.

Part 2: Shaping sentient minds: adaptation to the environment, examines the minds and skills of animals in groups defined not by their taxonomy, or their 'utility' (e.g. pet, farm, game, vermin) but by their habitats and the special challenges they present. I first examine animals in the natural environments of the waters and the air; least subject to interference from that most invasive of terrestrial species, mankind and therefore with most freedom to look after themselves. Terrestrial mammals are grouped according to their habitat. Animals of the savannah and open plains include the large number of herbivores (both wild and domesticated) and the smaller number of carnivores who prey on them. The chapter on animals of the forest gives special attention to the physical and social skills needed for life in the three dimensions of the tree canopy (Chapter 9). The last of the 'environmental' chapters (Chapter 10) considers our close neighbours, animals whose natural lives have been most affected by human interference, especially dogs, horses and animals confined to the farmyard or animal factory. In this section, I explore ways in which sentient animals build on the physical and mental tools acquired by way of their birthright in order to meet the special circumstances of their environment. These range from skills needed to manage primitive emotions like hunger, pain and fear to high-level cognitive formulations such as education and navigation, high-level emotional formulations like pleasure and grief, and the social graces of cooperation and compassion. Throughout this 'environmental' section, human attitudes are kept, wherever possible, off the page. The final section, 'Nature's Social Union', addresses

the critical second clause in my title 'Why it matters' on the sound basis that sentient animals have feelings that matter to them, so they should also matter to us. This section examines human attitudes and actions to animals so far as possible through their eyes, not ours and reviews how we can apply our understanding of the sentient mind to meet our duty of care. I pose and seek to address questions such as: 'What can we learn from the animals that will help us to improve their lives and ours? How should we use this knowledge and understanding in the context of our responsibilities to our fellow mortals in the home, on farms, in zoos, laboratories and in the wild? Humans are burdened with the responsibility of care for the living world, based on the principle of respect for all life. This applies not only to animals in our direct care but to those whose lives we affect indirectly through our choice of diet or our competition for habitat (which means, just about all of them and all of us). Our aim must be to seek an honourable social union that achieves justice through proper respect to the things that matter to us and those that matter to them.

Wherever possible, my conclusions and assertions have been drawn from the evidence of science and the careful observations of those with sound practical experience of animal life. However, this can never be enough. I am just as concerned about what we don't know about animal minds as what we do. I shall often enter the realms of pure, although rational, speculation and I shall leave a lot of questions unanswered. This a brief exploratory voyage into largely unknown waters and makes no claim to be definitive. The subject is wide open. My observations, thoughts and ideas are offered as substance for reflection, discussion and an outline chart for future explorers.