

Zoomorphism and anthropomorphism: fruitful fallacies?

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Abstract

Zoo- and anthropomorphism may both be scientific heresies but both may serve as a basis for thought (and real) experiments designed to explore our ability to assess quality of life as perceived by another sentient animal. Sentience, a major contributor to evolutionary fitness in a complex environment, implies 'feelings that matter'. Strength of motivation is a measure of how much they matter. Since humans and most domestic animals share the property of sentience, it follows that some aspects of feeling may be similar, and where we differ, the differences may be of degree rather than absolute. One of the assumed absolutes that I shall challenge is the concept that non-human animals live only in the present. I explore how domestic animals may experience the feelings of hunger, pain, fear and hope. Hunger is indisputably a primitive sensation. Pain and fear are primitive sensations with emotional overtones. The problem is to discover how they may affect quality of life. Acute pain and fear are positive signals for action to avoid harm. These actions and their consequences ('how well did I cope?') will be committed to memory and affect how an animal feels when they recur, or it fears they may recur. Hope (and its antithesis, despair) are considered by many philosophers (who do not own dogs) as emotions restricted to humans since only we can imagine the future. However, by application of zoomorphism we may classify hope with hunger as a primitive feeling of dissatisfaction with the status quo. Either may lead to action directed towards the goal of feeling better or encourage the belief that things will get better (food will arrive). Both are feelings of expectation for the future modulated in the light of past experience. With all these four emotions quality of life may be expressed in terms of how well the animal feels it can cope, both in the present and in the future. When it feels it cannot cope, then it will suffer.

Keywords: animal welfare, fear, hope, hunger, motivation, sentience

Introduction

Knowing animals is an admirable aim, yet an unachievable goal; very much like 'Limping towards Eden'. In the case of sentient animals who have "feelings that matter" (Webster 2005), the aim must be to try to understand how they feel, what feelings matter and how much. Social scientists studying the nature of sentience in humans would appear to have two arrows in their quiver; they can ask people what they feel and observe how they behave. However, this is not necessarily a bonus. To give an example very close to home; there are large discrepancies between the expression of human desire for higher standards of farm animal welfare and the manifestation of demand for more costly, high welfare products. The animal scientist can only observe behaviour. However, this is not necessarily a disadvantage, especially when we observe their behavioural responses to specific questions designed to challenge their feelings and provoke responses. This, of course, is the essence of motivation analysis as pioneered by Dawkins (1990). For a recent review of just how far this science has travelled, I recommend the review by Kirkden and Pajor (2006). This work addresses the very nature of sentience, pleasure and suffering since it reveals the feelings

that matter, measures how much they matter and points to how things may be improved.

Motivation analysis is a very powerful tool but largely constrained to the laboratory. Most of our claims to understand animals are simply expressions of how we feel they feel, and it is here, that consciously or otherwise, we resort to anthropomorphism and/or zoomorphism (hereafter the A and Z concepts). These words have several meanings: historically they have been associated with religious beliefs, eg belief in animal gods. In the context of the natural sciences they may be defined as follows:

- (i) Anthropomorphism (A): ascription of human characteristics to an animal
- (ii) Zoomorphism (Z): viewing human behaviour in animal terms

Viewed naïvely, both would appear to be naïve. In the former case, it is arrogant and sentimental to think that other animal species are just like us. In the latter, it is wilfully blinkered to assume that we can view human behaviour in terms that neglect to include uniquely human elements of language, self-awareness and ethics. Nevertheless these two

Table 1 Origins of behaviour in sentient animals.

<i>1 Perception of environmental stimuli</i>
External: 'friends and foes', novelty
Internal: hunger, cold
<i>2 Interpretation of stimuli</i>
Feeling: positive (good), aversive (bad), curious, indifferent
Cognition: learned images of actions and consequences
<i>3 Motivation to behaviour</i>
Maintain, or favourably adjust emotional state
Strength of motivation is a measure of how much feelings matter
<i>4 Measured response</i>
Seek, avoid, ignore

concepts do bear closer examination, if only as useful fallacies that may be recruited for thought experiments designed to explore our ability to assess quality of life as perceived by another sentient animal.

It is perhaps revealing that the sternest opponent of 'A and Z' was one St George Mivart, a biologist and contemporary of Darwin, who was ordained into (but later rejected by) the Catholic Church. He wrote:

to avoid the error of anthropomorphism, we fall into the vastly greater and more absurd error of zoomorphism.

The basis of his belief was that he could accept Darwin's big idea until it came to the descent of man. Mivart believed that man was a unique species, created by God and possessing a soul. This may not constitute a sufficient case for dismissal of the concepts of A and Z. Darwin (1872), on the other hand, sounds (at first glance) more cautious. He wrote:

man and animals express the same state of mind by the same movements.

In fact, this sentence contains a bombshell: the assertion that man and animals express, and by implication, experience the "same state of mind".

Let us consider the concept of anthropomorphism in a little more depth. We humans are feeling creatures. We share with many other animal species the property of sentience. We also possess (though do not always employ) the power of rational thought and expression. If we wish to compare the characteristics of humans and other animals, we need to distinguish between sentience (feelings) and thought (cognition). It is probably unproductive to apply anthropomorphism to the study of animal cognition, either as a tool for basic research into how they think, or within the context of animal welfare, since welfare is defined not by what they think but by how they feel. It is, however, valid to modify the definition of anthropomorphism to explore shared elements of emotion in sentient species. I call this 'Reverse anthropomorphism'. The question I ask is not 'how would this cow feel if it were me?' but 'how would I feel if I were this cow?'

Animal sentience

It is necessary at this stage to examine in a little more detail the nature of animal sentience. I have defined sentience as "feelings that matter" (Webster 2005). This simple definition recognises that the behaviour of animals is motivated by the emotional need to seek satisfaction and avoid suffering. Many of these emotions are associated with primitive sensations, such as hunger, pain and anxiety. Some species may also experience 'higher feelings', such as friendship and grief at the loss of a relative. This may expand the nature of their sentience but we should not underestimate the emotional distress caused to animals by hunger, pain and anxiety. They may be primitive but that does not necessarily make them any less intense.

The origins of behaviour in a sentient animal are summarised in Table 1. Consider the primitive sensation of hunger. Centres within the central nervous system responsible for control of appetite and satiety respond to a variety of sensations arising from internal and external stimuli: low blood glucose, the sight or smell of food, or a conditioning stimulus (eg the bell that preceded the meal for Pavlov's dogs). All this information within the category 'hunger-appetite-satiety' will be integrated in the form of an emotion. If the animal feels hungry it will be motivated to seek food. If a good meal arrives, it will feel pleasure. If no food is available it will feel bad. This psychological concept of mind makes a clear distinction between the reception, categorisation and interpretation of incoming stimuli. It is also consistent with neurobiology. Kendrick (1998), for example, has identified neurones within the brains of sheep that transmit different categories of stimulus. A wide range of images (eg sacks of grains, bales of hay) trigger signals in a family of neurones that categorise the information as 'food'. A second set of stimuli or images, eg dogs and men, form another category of information that we may call 'predator'. The information 'food' then proceeds to a second *interpretation* centre where it stimulates a family of neurones that transmit a positive emotion (good). The information 'predator' passes to another centre that transmits the negative emotion (bad). However, if the sheep is now presented with a picture of a human carrying a sack of food, the two categories of information (food and predator) are passed to the interpretation centre, evaluated together and in this case become a single, unconfused emotional message, namely 'good'.

The animal's decision as to how (or indeed whether) to respond is therefore determined by how it feels at the time, good, bad or indifferent. Moreover, in a sentient animal, the interpretation of information as good or bad is not a simple yes/no decision. The intensity of its feelings will vary. It will, for example, feel more or less hungry, more or less afraid, and this will determine the strength of its motivation to respond in positive or negative fashion. Through the academic study of strength of motivation in a sentient animal to seek or avoid the feelings it associates with certain sensations and experiences, we can obtain a measure of how much these feelings matter.

Motivation then stimulates behaviour. The animal performs a measured response; the intention usually being to seek, avoid or ignore the stimulus and thus maintain, or favourably adjust its emotional state. However, the process does not end here. The sentient animal, unlike (for example), an ant, 'hard-wire' programmed to deliver an invariant response, then reviews (if not consciously) the consequence of its actions. In the short term it asks the questions:

- (i) How do I feel now?
- (ii) How well did I cope?

Answers to these questions will affect its future emotional interpretation of stimulus, response and consequence. If the consequences were positive, it is likely to display habituation: ie the stimulus will become less of a threat. It may experience a sense of pleasurable anticipation (eg anticipation of a meal). If it perceives that the consequences of its actions were unfavourable it may then develop more negative emotions in the event of, or anticipation of, such events in the future. The behavioural expression of these negative emotions may present as signs of increasing anxiety, apathy or learned helplessness.

There is nothing unconventional about this argument. It is entirely consistent with the classic definition of Fraser and Broom (1990) that animal welfare is "the state of an animal as it attempts to cope with its environment". It does however create a distinction between *stress* and *suffering*. Stress is a measure of the effort of coping (Webster 2005). Suffering occurs only when an animal cannot cope, or has extreme difficulty in coping with unpleasant feelings either because the sensations themselves are too intense, complex or prolonged, or because it is unable to carry out the actions it feels necessary to achieve its physiological and behavioural needs. The former may be exemplified by the lamb dying from starvation and hypothermia, the latter by the sow confined on concrete in a pregnancy stall.

The logic of this argument challenges two enshrined articles of belief for natural scientists.

- (i) Since suffering and pleasure in a sentient animal are defined by its capacity to feel, not to think, we cannot assume that its welfare needs should be measured in terms of its apparent proximity to man on the tree of life. We cannot distinguish on grounds of sentience between the chimpanzee, the horse and the rat.
- (ii) Sentient animals learn by experience as they attempt to cope with life. If they fail, they suffer. Thus, most suffering is a learnt experience. This forces us to conclude that *sentient animals do not only live in the present*. Their emotional state will be defined by their expectations of the future in the light of past experience.

Hopes and fears

The concept of reverse anthropomorphism can be used to explore how the emotional state of sentient animals may be driven by their future expectations in the light of past experience. I shall illustrate this argument with reference to four emotions; hunger, fear, pain and hope. Few, I hope, will deny the capacity of sentient animals to experience the primitive

Table 2 Spectra of animal emotions.

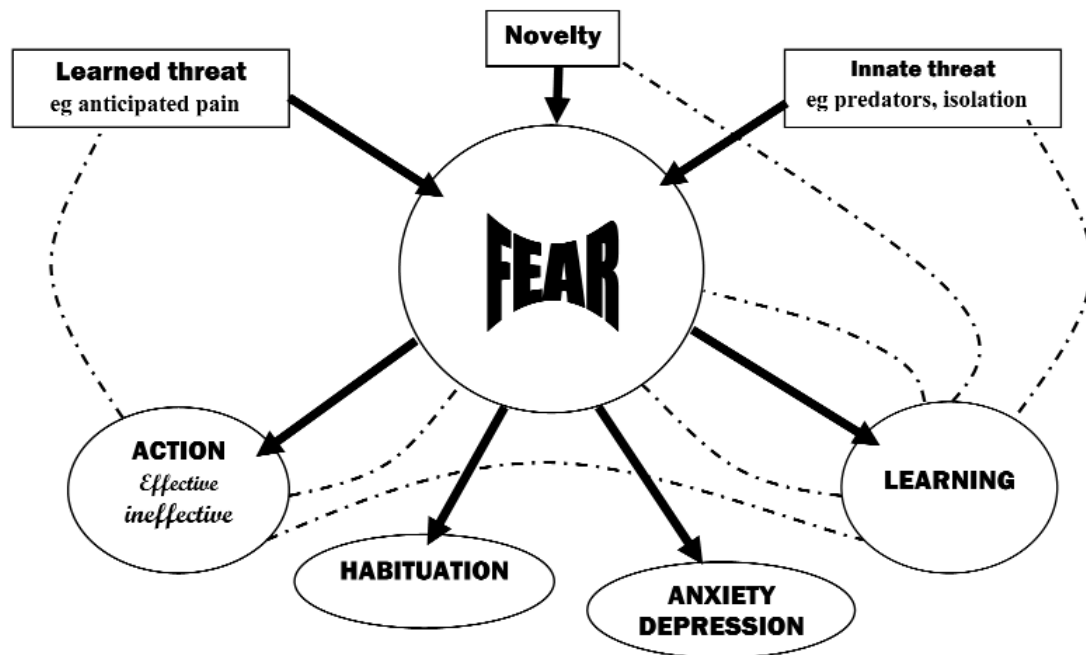
Security	Fear	Anxiety
Pleasure	Comfort	Pain
Satiety	Appetite	Hunger
Joy	Hope	Despair

emotions of hunger, fear and pain. What I wish to suggest is that the emotion of hope can be included within the same order of sentience. None of these emotions can be conveyed (except in an algebraic sense) by a single word (Table 2). The acute sense of fear represents one sensation within a spectrum whose limits may be defined by security and anxiety. The other three are less straightforward. However, if we accept Iggo's (1984) definition of pain as "an unpleasant sensory and emotional experience" then pain may be considered as a progressively unpleasant separation from a state of comfort. We may also put pleasure at the other end of the same spectrum: eg the hedonistic pleasure of a cat sitting before an open fire. Appetite is not strictly on the spectrum from hunger to satiety. It is similar but not identical to hunger as a motivating force stimulating the desire to eat or forage for food. The spectrum of 'Joy-Hope-Despair' appears straightforward enough in a human context. The question is whether we can apply it to other sentient animals.

Fear

Fear is an adaptive emotional response to perceived threat that acts as a powerful motivator to action designed, where possible, to evade that threat. It is also an educational experience since the memory of previous threats, the action taken in response to those threats and the consequences thereof: ('was it less bad than I feared or worse?') will obviously affect how the animal feels next time around. The causes and consequences of fear are illustrated in Figure 1 (Webster 2005). This identifies three main threats: novelty, innate threats and learned threats. Neophobia, or the fear of novelty, is an obvious survival mechanism. Success in life (evolutionary fitness) depends on achieving the right balance between curiosity (to develop survival skills) and caution (to avoid danger). Among these skills is the ability to distinguish between threats that are real or imaginary. Innate fears (eg primates' fear of snakes) mostly have survival value. Although they are relatively hard-wired, they can be overcome by experience. Fear of a learned threat is self-evidently one that is acquired by experience, eg situations that have in the past led to pain; ie the repeat visit of a dog to the veterinarian. The dog that is taken back to boarding kennels prior to the annual family holiday may display a rather more advanced form of learned fear; that of desertion by key members of its social group. Stimulated by fear, the animal takes what action it can. If it learns that its action has been successful it discovers

Figure 1



Causes and consequences of fear (from Webster 2005).

Table 3 Behavioural evidence for pain as a sensation and an emotion in sentient animals.

Behaviour	Examples	Sensation	Emotion
Immediate reaction	Withdrawal	Yes	No
	Alarm	Yes	Possibly
Modified behaviour	Rest and locomotor changes	Yes	?
	Learned avoidance		Possibly
	Reduced grooming	Yes	Possibly
Altered mood	Reduced grooming	Yes	Possibly
	Apathy, reduced appetite		Possibly
Response to analgesics	Externally administered	Yes	No
	Self-selected	Yes	Yes

that it can cope and its sense of security is likely to be enhanced. If it learns that it is unable to resolve the problem as a result of its actions, or its inability to act, its emotional state is likely to deteriorate and may proceed to a non-adaptive state of anxiety or depression.

Here are two examples set within the context of farm animal husbandry:

(i) Stockmanship — while many farm animals (not goats!) have an innate fear of humans, their sense of security may be enhanced by sympathetic stockmanship; harsh, or erratic

stockmanship can create a feeling of chronic anxiety and the expression of aggression or exaggerated fear.

(ii) ‘Normal sights and sounds of farm activity’ — farm animals readily habituate to ‘unnatural’ sights and sounds (eg tractors, manure scrapers) so long as they are in the reassuring company of others of their kind and learn that they pose no threat. On the other hand, animals reared in isolation or in darkness and silence (eg veal calves in traditional crates: Webster *et al* 1985) display exaggerated fear when faced by almost any disturbance.

Pain

Definition of pain in a sentient animal as “an unpleasant sensory and emotional experience associated with... tissue damage” (Iggo 1984) acknowledges that pain is more than just a bad sensation, it is likely to cause a deterioration in mood (affect or emotional state). Many conservative biological scientists (and biological scientists can be very conservative) dodge altogether the subjective issue of mood and talk only of nociception. Some have argued that pain, even in humans, is such a subjective experience that it is not open to scientific investigation. To answer them I recruit Wittgenstein (1953) “just try, in a real sense to doubt someone else’s fear and pain”.

If we are to ask whether pain is an emotional experience in sentient animals we need to employ the technique of triangulation and approach the question from several directions. Table 3 (adapted from Webster 2005) summarises ways by which the sensation and emotion of pain may be assessed from observations of animal behaviour. Alarm and acute withdrawal can be explained simply as a reflex response to a sensation associated with a potentially harmful stimulus. Learned avoidance of situations that have caused pain in the past would seem to be an emotional response but we cannot necessarily assume that it is associated with distress. Changes in maintenance behaviour, eg grooming, may be an expression of mood change (ie apathy, depression) or more simply reflect the fact that the action has become somewhat uncomfortable. However, appetite depression is more likely to reflect altered mood. Increased activity in response to externally administered analgesics can simply be attributed to a reduction in pain sensation. However, self-selection of anaesthetics (Danbury *et al* 1999) is strongly suggestive of a learned response designed to bring about an improvement in emotional state.

While none of these measures is in itself justification for the reverse anthropomorphic (RA) assertion that “if I were a cow with a sole ulcer I would experience both the sensation of pain and a sense of depression, particularly when I knew that I would, in the near future, have to take a long walk along a stony path”, I believe that, taken together, they force us to give her the benefit of the doubt. I repeat the words of Wittgenstein; “Try to doubt her pain”. It may, however, be less easy to empathise with a fish and scientists have, until recently, been particularly cold-blooded in this respect. It has, for many years, been common for scientists to assert that fish cannot experience pain, even as a sensation, because they don’t have the right sort of brain (for review, see Rose 2002). The obvious flaw in this casually arrogant assumption is that it was made in the absence of any attempt to ask the fish. As we apply the range of questions listed in Table 3 we are forced ever more towards the conclusion that pain in fish is not only real but a matter of both sensation and emotion (eg Sneddon *et al* 2003).

Hunger and appetite

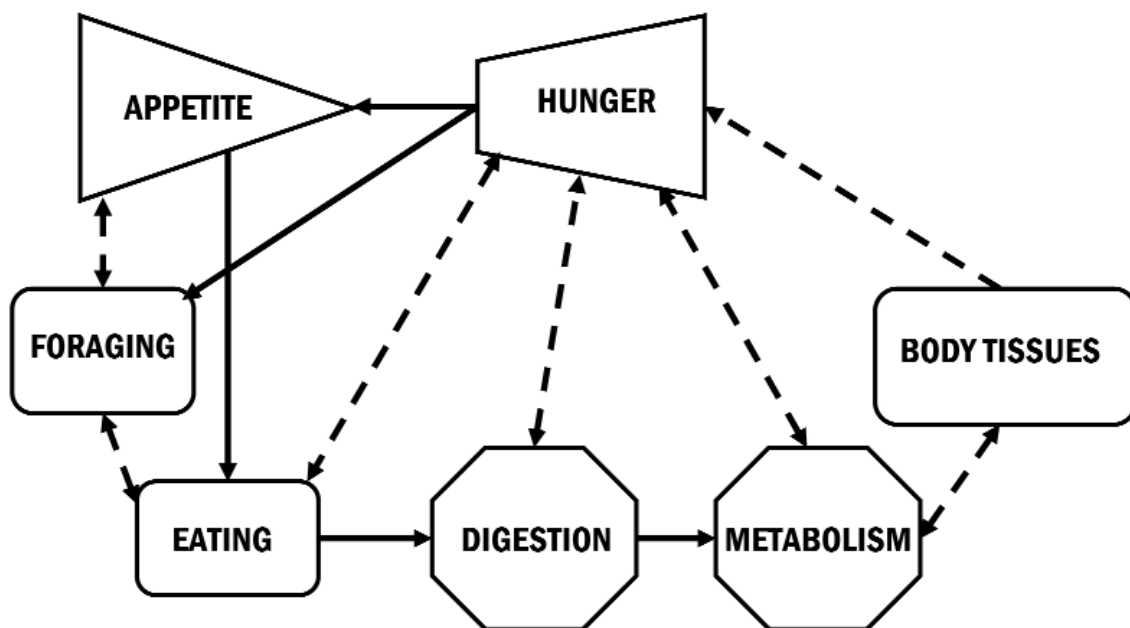
Hunger and appetite are similar, though not identical emotions that motivate actions designed to seek and ingest food; ie foraging and eating (Figure 2). Hunger, or more correctly, physiological state within a spectrum from extreme hunger to satiety, represents the emotional integration of many symptoms from the internal environment, gut fill, concentrations of metabolites absorbed from recent meals, overall body condition. These define the strength of motivation to eat. Appetite is determined by stimuli from both the internal and external environment; metabolic hunger for nutrients and the presence, or expectation, of attractive food. The reward for actions designed to assuage appetite and relieve hunger are two-fold, the physiological satisfaction gained from acquiring nutrients and the behavioural satisfaction gained from discovering and consuming food. Both these needs are important to a sentient animal and can, to some extent, compensate for one another. An animal that is experiencing satiety is less motivated to forage, obviously. Equally, an animal that has access to forage can satisfy this behavioural need even though the quantity and quality of food may not meet its nutritional requirements.

Table 4 presents examples of some problems and solutions for hungry farm animals. The first category, which includes many dry sows and stabled horses, is that of animals who are supplied with enough nutrients to meet their physiological needs but who are profoundly frustrated by the inability to satisfy their motivation to forage. In this case, the solution is to provide more foraging opportunities without significantly increasing nutrient intake; ideally the satisfaction gained not just from the presence of fibrous food but from the act of foraging for oneself. An entirely different situation is faced by the high yielding dairy cow. She has a massive physiological need for nutrients to meet the metabolic demand of lactation but is commonly unable to eat enough to meet this demand, either through lack of time (eg while at pasture) or because she cannot digest the feed fast enough. She is paradoxically, simultaneously metabolically hungry and physically full up. Here, the solution is to optimise both the digestibility and the nutritive value of the feed.

The third category, the broiler breeder, is a bird that has developed a pathologically abnormal appetite as a result of selection for rapid growth. It would be an abuse of welfare, indeed lethal, to allow it full expression of its abnormal behavioural need. On the other hand, simple provision of a high quality diet designed to sustain health through provision of correct amounts of nutrients will lead to expressions of distress, manifest, eg by aggression or self-mutilation. In this case, the need is once again to provide some behavioural satisfaction without significantly increasing nutrient supply. Provision of a minimally productive foraging reward would be a positive gesture.

The final category is probably the most important, if only in terms of the numbers involved. Many, indeed most, wild and domestic grazing animals are likely to go hungry for some of the year (winter in the temperate zones, the dry

Figure 2



Hunger and appetite as motivating forces: stimulus and response (from Webster 2009).

Table 4 Problems and solutions for hungry farm animals.

Categories	Problems	Solutions
Dry sows	Frustrated foraging	Create foraging opportunities
Stabled horses		
Dairy cows	Metabolic hunger	Optimise digestibility
	Gut overload	Improve nutritive value of feed
Broiler breeders	Abnormal appetite	Decrease nutritive value of feed
		Provide foraging possibilities
Out-wintered sheep and cattle	Metabolic hunger	Nutrient supplements
	Frustrated foraging	Create foraging opportunities

season in the tropics). It is entirely natural for grazing animals to build-up body reserves and meet the major demands of reproduction during seasons of plenty, and subsist, in part, off these reserves when food is of poor quality and in short supply. In the wild and in well-managed pastoral systems for domestic animals, the quality of grazing and browse outwith the growing season is seldom sufficient to meet nutrient requirement, even for maintenance, and animals lose condition. Feed blocks set out on the pasture may be used to supplement specific nutrients, such as protein and minerals. However, so far as the animals are concerned, (application of RA), the most important issue is to have some opportunity to forage and something to eat, however poor and scant this may be. A grazing animal that is able to forage may remain hungry but at least it can take constructive action to address its emotional state.

Hope

The main thrust of the argument so far is that sentient animals cannot be thought of as living only in the present. They remember past challenges, actions taken and their consequences. These memories influence both their subsequent behaviour and their emotional state. Failure to cope with pain and fear can induce depression or anxiety. Success at foraging can assuage the pangs of hunger. Clearly, these animals have some expectation of the direct consequences of their actions, based on past experience, but can it be called hope as we understand it?

I now recruit, for the first time, the concept of zoomorphism, viewing human behaviour in animal terms, and once again I turn for support to Ludwig Wittgenstein. Here are two quotes from his *Philosophical Transactions* (1953):

One can imagine an animal angry, frightened, unhappy, happy, startled. But hopeful? Why not?

Hope is an expression of belief... but belief is not thinking.

When we examine Wittgenstein's assertion that "Hope is an expression of belief; but belief is not thinking" within the context of the study of animal motivation, then hope may be defined as a positive motivating force; a feeling of expectation that through my actions or the actions of others, something good will ensue. It may be an anthropocentric error to view the concepts of hope and despair, as we humans understand them, as products of an aware, thinking mind; instead we should simply accept them as expressions of sentience. Human development of the concept of hope may be much more complex than that of other animals and it may extend, not always rationally, much further into the future *viz* "the sure and certain hope of the resurrection to eternal life". However, I can find no fault in defining hope simply as an emotional belief that the state of feeling good can be sustained or improved. Justification for the concept of hope in non-human animals may be obtained by linking it to the primitive emotion of hunger. Calves that start to bleat for milk, sows that chew bars, wild cats that pace their cages in anticipation of feeding are (in these circumstances) displaying an emotion linked to the expectation that food will arrive at the hoped-for time. When the hoped-for event arrives, then their behaviour is consistent with pleasure.

The concept of hope as a learned emotion, a feeling about the future, based on past experience may be particularly relevant to farm animals because their rewards are so dependent on the actions of the stockpeople. If a farm animal is accustomed to being fed at regular intervals, then this practice stops, this positive expectation will progressively erode and be replaced by a negative sense that is likely to be greatest at former meal times. The animal may learn, and thus come to expect, a perfectly satisfactory alternative source of pleasure. However, if this hope is not fulfilled then somewhere en route towards despair, normal anticipatory behaviour may develop into stereotypies and other manifestations of disturbed behaviour. Anticipatory bar chewing in sows may progress to stereotypy, prolonged and emancipated from any normal external stimulus. The dog that is repeatedly disappointed by the non-return of its master at the expected time may develop prolonged and incurable separation anxiety. The primate confined for years in a barren cage is likely to express the signs (or non-signs) of extreme apathy. Conclusions from such observations can be reinforced by hard evidence from controlled trials with laboratory animals. Social challenge leading to defeat can have a lasting effect on neuronal development in mice, leading to lasting changes in physical and emotional development; eg decreased growth rate, increased anxiety (Koolhaas *et al* 1999). The word to describe such failures of hope has to be despair.

Conclusions: uses and abuses of anthropomorphism and zoomorphism

It has not been my intention to get into a semantic argument as to the validity of the concepts of anthropomorphism and zoomorphism but to explore how they may be used with care to extend the conventional boundaries of natural science.

Zoomorphism is seldom of much help in the study of animal behaviour and animal welfare. For the most part it is applied (seldom wisely) to the behaviour of humans, which is not our concern. However it can, I suggest, be a useful antidote to anthropocentric beliefs that so-called 'higher' emotions, such as hope and despair, love and grief, are unique products of human consciousness and self-awareness. These emotions don't have to be expressed in words. We, like Darwin (1872), should ponder just how sentient animals express these things and the feelings that motivate these expressions.

Anthropomorphism is wide open to abuse. As a general rule it is pointless to ascribe human characteristics of feeling and especially thought to other animal species; they evolved to promote their own fitness, not as earlier drafts in the development of man. On the other hand, 'reverse anthropomorphism' is, I suggest, a useful concept but only if used with care. It is valid to ask 'how would I feel if I were this cow?' but it is a question that should be posed with humility and in the expectation that I could be quite wrong because cows and I might have an entirely different set of priorities. RA should not therefore be considered as a sufficient basis from which to reach conclusions and pass judgement but as a basis for experiments designed to explore the nature of shared elements of sentience. Indeed, it may be argued that RA is the expression of human sentience that has given rise to our cognitive development of the science of motivation analysis. The simple message is that, wherever possible, we should ask the animals.

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