

Could empathy for animals have been an adaptation in the evolution of *Homo sapiens*?

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Abstract

In humans, empathy has emotional and cognitive components, both of which are linked to caring and nurturant behaviour. Variations in each of these facets of empathy were likely to have been accessible to natural selection during the evolution of *Homo*, although the likely details of their respective adaptive values has so far only been considered in the context of intraspecific (human-human) behaviour. We propose that evolutionary psychology may provide a useful additional framework for examining why humans feel empathy for certain animals but not others. Phobias towards noxious animals, such as snakes and spiders, have been explained in terms of gene-culture co-evolution, but the possibility of an analogous 'biophilia' directed towards other animals has received less attention. The redirection of primarily intraspecific nurturant behaviour towards the young of non-human species may be a general human trait since it is practiced in a wide variety of cultures, including hunter-gatherers, and may arise from the merging of natural history and social intelligences that the archaeologist Steven Mithen suggests evolved ~100,000 years before present (YBP). The visual stimuli that evoke such nurturant behaviour, Lorenz's 'Kindschenschema', or 'cuteness', have been compared with the super-stimuli whereby parasitic cuckoos induce caregiving from their hosts, but recent evidence suggests that human females of childbearing age are especially sensitised to respond most strongly to characteristics of human infants, and may correspondingly become less attracted towards 'cute' animals. It is also possible that during human prehistory, the ability to care for young animals was selected for, in adolescent females, as an honest indicator of future quality as a mother. An ability to empathise with animals may also have given certain individuals and/or groups of kin an evolutionary advantage in hunting, and subsequently herding and domesticating, animals. Concern for animal welfare may therefore stem from an evolved human trait, even though its degree and extent of expression are undoubtedly strongly influenced by culture.

Keywords: animal welfare, domestication, empathy, *Homo sapiens*, nurturance, pet-keeping

Introduction

The intensification of animal production since the 1940s has enabled a rapid increase in the global human population, and could therefore be regarded as adaptive for *Homo sapiens*. By contrast, the simultaneous and possibly connected, increase in public concern for the welfare of production and other animals, which has slowed the adoption of intensification (Fraser 2005), could be regarded as only adaptive, in the strictly material sense, for those individuals (including animal welfare scientists like ourselves) who gain resource and social approval by promoting the cause of animal welfare. Mankind might find it easier to find a rational basis for feeding itself without the emotional baggage that comes from empathising with its food animals. In this paper, we examine the evidence for a biological (ie evolved) basis for human empathy towards certain animals, and not others, though we concede from the outset that the intensity and expression of that empathy is influenced by culture and by individual experience. We also

acknowledge that this evolutionary psychology approach is likely to generate more questions than it provides answers (cf the human predilection for music; Cross 2007).

The concept of empathy in human intraspecific social behaviour

The term empathy is used colloquially to refer to the capacity that people have to understand and share the feelings of others. When we see someone crying, it can make us feel sad; when we see a mother being reunited with her lost child, we can both appreciate and share something of the feelings of happiness and relief she is experiencing. Psychologically, such empathic processes result from complex, multi-level processes (Preston & de Waal 2002; Seitz *et al* 2006; Singer *et al* 2006). Specifically, most empathising can be divided into two core components: emotional and cognitive. The emotional component of empathy involves the tendency to match one's emotions to those observed in another, either as a result of associative learning or more specific action-perception mechanisms

(de Waal 2008). The cognitive component of empathy, on the other hand, involves a number of capacities, including the ability to accurately detect and label the emotions we observe in others, and to 'mentalise' or to show emotional 'theory of mind' (Baron-Cohen *et al* 1985, 2001). This mentalising capacity is sophisticated and develops relatively late in childhood (Frith & Frith 2003; Rankin *et al* 2005; Singer *et al* 2006) — it enables us to imagine what a person is likely to be experiencing in any given emotive situation, even if we are not in that situation ourselves. Combining emotional and cognitive empathy processes allows older children and adults to show sophisticated empathising skills, such as the ability to distinguish emotions that concern their own situation with those that concern the situation of the other (eg someone may feel sorry or sad for a friend who is anxious about, for example, an imminent trip to the dentist, but they wouldn't feel anxious for themselves, because that situation does not pertain to them). It is this complex combination of cognitive and emotional processes that can lead to the sorts of compassionate, sympathetic and helping behaviour that are generally discussed as key outcomes of empathy (eg see Eisenberg 2000). The absence of normally developed cognitive and emotional empathic processes, on the other hand, is associated with disorders such as autism and psychopathy, in which individuals show severe social functioning deficits and incomplete empathic abilities (eg Blair *et al* 1997; Blair 1999).

A variety of suggestions have been made about the possible evolutionary origins of empathy. Foremost amongst such ideas is the notion that empathic capabilities have proven adaptively advantageous to humans (and some other social species), for example, enabling pro-social behaviour and inhibiting aggression (eg Batson 1991; de Waal 2008). Evidence to support this possibility comes from a number of experimental studies that have found variation in self-reported and objectively measured empathising ability (eg skin conductance responses to the emotional expressions of another) to be associated with higher levels of helping behaviour (Eisenberg & Miller 1987) and lower levels of aggression (Miller & Eisenberg 1988). Also, the finding that empathic variation has a strong heritable component confirms that the prevalence of such behaviours will have been available to modification through natural selection (Davis *et al* 1994; Gregory *et al* 2009). However, our understanding of the possible adaptive origins of people's empathic capabilities is still far from complete. Specifically, it would be useful to identify what kinds of behaviour natural selection has acted on to construct what we now regard as empathy; that is, to what extent selection pressures have acted on either the behaviour patterns that have arisen from a capability to empathise as a whole (eg helping, altruistic actions), or from cognitive and emotional empathic processes separately, or from an even greater number of sub-components of the empathic process. The observation that individual variation in cognitive and emotional components of empathy do not consistently covary, and the finding that their neural substrates differ substantially both in location and likely evolutionary age (with emotional

empathy having earlier developmental and phylogenetic origins than cognitive empathy; Singer *et al* 2006) suggests that at least two separate adaptive processes are likely to have operated within the evolutionary history of human empathic behaviour. Interestingly, the finding that both the more recent cognitive and older emotionally empathic processes appear to be expressed more strongly in women than men (Baron-Cohen 2003), suggests that, while quite probably having had different functions, both these functions have proven disproportionately advantageous to females and/or disadvantageous to males. Theories of empathy that emphasise its function within mother/mother-offspring relationships support this.

The phenomenon of nurturance may shed some light on ideas concerning the evolution of empathy. The terms nurturance and nurturant behaviour have primarily been used to describe the various care-giving behaviours that are directed towards babies and young children, both by parents and by other helpers and care-givers. Like empathy, nurturance can be thought of as a multi-component process, the capacity for which, as a whole, varies from individual-to-individual. It entails a variety of essential practical behaviours that make up the care-giving process, which can distinguish an effective parent from an unsuccessful one (eg provision of shelter, food, etc). But it also entails the emotional facets of care-giving, such as the tendency to be attracted to, and to form attachments with, one's offspring; tendencies that, like empathy, tend to be more powerful in females than males (Taylor *et al* 2000). The capacity to respond empathically to the distress or other emotional expressions of infants and children (both by simple emotional matching, but also by more child-directed feelings of sympathy, concern or compassion), must inevitably be a key component of this emotional nurturance process (de Waal 2008). Thus, while the nurturance construct as a whole differs from that of empathy, it has shared components, most notably in the realm of emotional empathic responding. Selection pressures for nurturant behaviours are likely to have been powerful for evolving humans. A basic level of nurturance is essential for survival of highly dependent, altricial young. But even beyond this basic level of care-giving, emotionally nurturant care-giving can confer enormous advantages to the developing child, assisting in healthy psychological development by generating positive, active and self-efficacious approach to life (MacPhee & Andrew 2006; Farah *et al* 2008).

Biophobia and biophilia

The evolutionary origins of human attitudes and behaviour towards animals have received little research attention, despite the ubiquity of intense, close social relationships with pet animals (Kidd & Kidd 1987) and widespread sympathy for the welfare of (some) animals (Appleby 1999). The best documented examples are the biologically predisposed aversions, or biophobias, that many primates, including man, learn towards venomous animals, especially spiders (Gerdes *et al* 2009) and snakes (Ulrich 1995; Öhman & Mineka 2001). Avoiding poisonous snakes is

self-evidently adaptive, and is likely to have been sufficiently important for survival in areas where they occur for such a specific trait to have evolved; for example, vervet monkeys have distinct warning calls for each of their two main predators, leopards and eagles, and a third for snakes (Seyfarth & Cheney 2003). Human children seem both fascinated by and repelled by snakes, and snake phobia is about 30% heritable in man, implying a genetic basis (Kendler *et al* 1992), presumably because selection for snake phobia has been more intense in some human populations than in others.

It is self-evidently reasonable that such biophobias have proved advantageous throughout human history. It has also been suggested that humans may have innate positive emotional responses towards particular features of the natural world, including animals, among these the concept of 'biophilia', somewhat vaguely described by EO Wilson (1995) as "the innately emotional affiliation of human beings to other living organisms". There is some evidence that supports a sort of biophilia towards certain kinds of productive landscapes (Ulrich 1995) which is likely to have been adaptive for hunter-gatherer societies, and may explain the modern-day benefits to health of green space (Pretty 2004). Although not conventionally described as 'biophilia', there is also evidence for a genetically based attraction towards and preference for certain other kinds of non-human animals, especially young mammals. In modern Western societies this finds its most obvious expression in pet-keeping, but the practice of hand-raising the young of a wide range of wild species appears to be rather common among hunter-gatherer societies (Rival 1993; Serpell 1996; Fausto & Rodgers 1999; Seitz 2007), and may therefore be a general human trait. In some cultures, most notably the Guaja of Amazonia (Cormier 2003), young mammals are suckled as if they were human children. Although there is self-evidently a strong influence of culture on the precise form of such interspecific nurturant behaviour, we suggest that its near-universality provides evidence for an underlying biologically-based emotional empathy towards animals, especially young animals, triggered by a set of characteristics, which may be loosely summarised as 'cuteness', and appear to be identical to those that stimulate care-giving towards human infants (Glocker *et al* 2009).

Stimuli for emotional empathy and nurturance

Stimuli that are characteristic of young animals and trigger caring responses in adults of the same species are self-evidently adaptive for parental care, and appear to be widespread in mammals and other taxa. The importance of 'cuteness' in the attraction of humans both to their own children and to animals with baby-like visual features, originally proposed by Lorenz (1943) as 'Kindschema', has been evidenced by two natural experiments involving representations of animals. The cartoon character Mickey Mouse has become progressively more infant-like (larger eyes and forehead, rounder nose and chin) between its invention in the 1920s and today (Gould 1980), and some current cartoon characters, for example the Japanese 'Hello

Kitty', have round heads, similar in size to their bodies, large foreheads and widely spaced eyes. However, these representations are controlled largely by the owners of their copyrights, and the mechanisms underlying their infantilisation are therefore not transparent. 'Teddy bears' (soft toys originally modelled on the brown bear) have likewise 'evolved' during the course of the 20th century, from a naturalistic depiction with a wild-type head and snout, to a more infantile appearance with a larger head: body ratio, large forehead and short snout (Hinde & Barden 1985); the 'selection pressure' is most likely to have come from those who choose to purchase them, most likely adult females, rather than their designers. The preference for infantile features in teddy bears emerges in children of both sexes between 4 and 6 years of age, and pseudo-nurturant behaviour towards such toys a year or so later (Morris *et al* 1995). Direct comparisons between images of young and adult animals (chimpanzees, rabbits, dogs and cats: Sanefuji *et al* 2007) (dogs and cats: Sherman *et al* 2009) have, unsurprisingly, identified 'cuter' ratings for the younger animals, and Sherman *et al* (2009) showed that viewing cute (animal) images temporarily enhances fine-motor dexterity, one component of effective nurturant behaviour towards delicate young. It seems reasonable that such preferences and behaviour may be the same as those that result in the adoption of young animals by children and adult females in hunter-gatherer communities.

When directed at human infants, nurturant behaviour is enhanced by the cuteness of the infant (Langlois *et al* 1995; Glocker *et al* 2009: see also Sherman *et al* 2009), and by the gender and hormonal status of the respondent, with women taking oral contraceptives and pre-menopausal women showing the highest sensitivity (Sprenghelmeyer *et al* 2009). All these characteristics are those that would be predicted if the 'cute response' had evolved as an adaptation facilitating care-giving towards human infants. Given that this response shows many consistencies irrespective of whether the target infant is human or animal, it has to be questioned whether the direction of nurturant responses towards animals is adaptive, selectively neutral, or maladaptive for the human concerned (as it appears to be today in the Guaja Indians, whose pet monkeys are reservoirs for tuberculosis) (Cormier 2003). Archer (1997) has cast pet-keeping as a form of social parasitism, and compared the cute features of young animals with the superstimuli that cuckoos use to manipulate their foster parents. However, Serpell (2005) has pointed out that, unlike cuckoo foster-parents, humans are fully aware that young animals are not their own offspring, and care for them both willingly and deliberately. He has postulated that pet-keeping is not in fact as costly as it would appear from a simple consideration of the resources consumed, citing recent studies that indicate that pets provide psychological benefits, such as social support and enhanced feelings of well-being. However, these benefits are not yet fully confirmed or understood, and may be reflections of the role of pets in modern society rather than adaptations that could have enhanced the reproductive fitness of our hunter-gatherer ancestors.

Of course, it is quite likely that cuteness is such a powerful and persistent releaser that it can override any conscious realisation that the animal is a net consumer of resources, perhaps because the response to cuteness is powerfully rewarding in its own right, even analogous to an addiction. Archer (1997) has argued that natural selection may have been unable to refine the 'cuteness response' sufficiently to the point that it is only triggered by human infants, given that the fitness costs to humans of failing to look after their own young are likely to far outweigh any gains from avoiding adopting young animals. Based on a small study of women's relationships with their cats, Collis *et al* (1998) found that those who were pregnant or had small children rated their attachment to their cat lower than those with no children or with school-age children. This may reflect the greater precision in cute responses induced by female reproductive hormones (Sprenkelmeyer *et al* 2009), such that the cute response towards animals is reduced when it is essential that it is focused to ensure the well-being of human infants.

Cognitive empathy directed at animals

So far, we have only discussed those emotional aspects of empathy, and related behaviour that may have a strong heritable component, even in humans (see also Phillips 2009). However, our relationships with animals self-evidently also have a cognitive component; indeed Serpell (2005) has suggested that anthropomorphism, the projection of human thoughts, feeling and attributes on to non-human animals, is a defining component of pet-keeping. Anthropomorphism may also be a very ancient human characteristic. The archaeologist Steven Mithen has argued that the ability to 'think like an animal' is a unique feature of the brain of *Homo sapiens sapiens*, evolving some 100,000 years before present (YBP) (Mithen 1996, 1999). The Neanderthals *H. neanderthalensis*, while their brains were a little larger than those of modern humans, showed little evidence of any relationship with animals other than as predators, using only simple tools (thrusting spears) and unsophisticated, confrontational hunting techniques. Mithen (1999) explains this by postulating that Neanderthals had discrete domains of intelligence for intraspecific social behaviour, technical skill and the natural environment, but that these were never properly integrated. In other words, while they had a 'theory of mind' for their own species, they appear to have been unable to 'think like an animal', either to anthropomorphise them or to use animals as symbols with quasi-human or mystical properties. The merging of social and natural history intelligences may be indicated by the first appearances of animal parts buried alongside *sapiens*, some 100,000 YBP (Mithen 1999). The development of a theory of mind for animals would have conferred the significant advantage of being able to out-think prey animals, predicting their movements and developing more sophisticated hunting and gathering strategies: for example, being able to think "if I were a turtle, where would I hide my eggs" (Katcher & Wilkins 1995). Totemism, the symbolic representation of people by animals, and the counterpart of this anthropomorphism, may have arisen at the same time, as a result of a two-way

flow of information between social and natural history intelligences, although its concrete expression, in totemic art, did not appear until some 30,000 YBP (Mithen 1996).

Domestication of animals

So far, we have proposed that nurturant and emotionally empathetic responses towards young animals are an ancient trait of *H. sapiens* and possibly even earlier hominids. Additionally, we can speculate that when cognitive empathy with animals evolved some 100,000 years ago, this could have acted in combination with emotional empathy to pave the way for the collection and nurturance of young animals from the wild, as still practiced by many of the hunter-gatherer societies that survived into the 20th century. Mithen (1996, 1999) has further speculated that, subsequent to the merging of natural history and social intelligences early in the evolution of *H. sapiens*, these in turn merged with the domain for technical intelligence some 50,000–30,000 YBP, accounting for the subsequent manufacture of tools from animal parts, such as bones and antlers, representations of beings that are part animal and part human and, eventually, domestication, starting with the dog at least 12,000 YBP and progressing to the sheep and goat 8,000 YBP, and then to other production animals.

Domestication requires the isolation of viable populations of animals from their wild counterparts for many generations (Clutton-Brock 1987). In addition to the well-established pre-requisites of the presence of pre-adapted wild species and well-organised human communities (Smith 1995), the extreme rarity of animal domestications (Diamond 1997) suggests that, at the time, only a few humans may have possessed the necessary combination of intelligences required. We suggest that a refined sense of cognitive empathy with animals would have permitted the prediction of how the animals were likely to behave under different sets of circumstances, thereby making them easier to control. A powerful emotional empathy might have led to (i) a pool of young animals being cared for as pets, which could be used to replenish the main herd as and when required and (ii) an emotional attachment to the proto-domesticates, which would inhibit their wholesale slaughter in favour of continuing to obtain meat by hunting wild animals, and thereby sustain the genetic characteristics of the captive population that had been (thus far passively) selected as suiting them for eventual full domestication. Societies which contained such people would, we predict, thrive at the expense of those which did not, and within those societies such individuals might acquire power and prestige because of their ability to control animals. Indeed, Hayden (1990) has proposed that domestication was initially adopted as a tactic within resource-rich societies whereby accumulators could out-compete their rivals within those societies, citing the apparently marginal biological value of many of the first domesticants, including dogs, gourds, chilli peppers and avocados (although see Weisdorf 2005 for more conventional views). However, whether domestication of animals initially provided nutritional advantage or social advantage, either way those who

excelled at it would have left more descendants than those who did not. According to Mithen (1999), cognitive empathy towards animals had already become a defining characteristic in *H. sapiens* long before domestication, because of the selective advantage it provided in improving hunting methods. We are suggesting here that emotional empathy towards animals likewise became a defining characteristic of our species as domestication of animals occurred, because those individuals who possessed it, and/or were able to combine it most effectively with cognitive empathy, were those who accumulated the most power and thereby left the most descendants. Only subsequently, as human group sizes became larger and more stratified, would the ability to manipulate people become more adaptive than the ability to manipulate animals, resulting in the relegation of those skilled in animal care to the lower echelons of society (Diamond 1997).

Implications for animal welfare and human-animal relationships

According to our conception, pet-keeping is thus a fundamental and ancient attribute of our species (see Kidd & Kidd 1987; Brown 2004; Serpell 2005 for other frameworks), and arises from the same biological processes that have more recently given rise to concern for animal welfare. Pet-keeping is a redirected form of nurturant behaviour that evolved primarily to evoke sustained care of human infants and children. The question still remains as to whether such behaviour was maladaptive but not sufficiently so to cause selection against it, or whether it was sufficiently adaptive to have been positively selected for. The little evidence that exists suggests that human females do direct nurturant preferences adaptively when necessary (ie when they have dependent young or are pregnant) and that this may have a physiological as well as a cognitive and cultural basis. Nurturant behaviour directed at young animals may therefore not be as biologically costly as some authors (eg Archer 1997) have speculated. Examining the possibilities that nurturant behaviour towards animals may have been adaptive for our forebears, we can first speculate that the ability to look after young animals may have been used as an honest signal of nurturant behaviour in young women before reproductive maturity, as practiced by the Guaja (Cormier 2003), and thereby positively selected for. The ability to understand and empathise with animals, an important requisite for domestications, may have exerted a second positive selection pressure for emotional empathy and nurturance directed at animals, overlapping with but distinct from the selection for cognitive empathy and 'theory-of-mind' that may have been selected for earlier in human evolution by its enhancing success in hunting wild animals.

We conceive the modern concern for animal welfare as arising from a confluence of two biologically based human traits: cognitive empathy, which allows us to project human values on to animals, and an emotional empathy that allows us to sympathise with animals that are (or appear to be) suffering (see also Phillips 2009). To what extent these tendencies are expressed, and the

animals (species) on to which they are projected, appears to be an interplay between their appearance, with human- and especially baby-like animals receiving the most sympathy, and powerful cultural factors. For example, the Guaja keep dogs to assist them in hunting, but claim they (in common with all their domesticates) lack souls, and treat them cruelly; ironically, one of their dogs' main sources of food is scraps dropped by their pet monkeys.

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