



Why Do People Love Their Pets?

John Archer

*Department of Psychology, University of Central Lancashire, Preston,
United Kingdom*

The evidence that people form strong attachments with their pets is briefly reviewed before identifying the characteristics of such relationships, which include pets being a source of security as well as the objects of caregiving. In evolutionary terms, pet ownership poses a problem, since attachment and devoting resources to another species are, in theory, fitness-reducing. Three attempts to account for pet keeping are discussed, as are the problems with these views. Pet keeping is placed into the context of other forms of interspecific associations. From this, an alternative Darwinian explanation is proposed: pets are viewed as manipulating human responses that had evolved to facilitate human relationships, primarily (but not exclusively) those between parent and child. The precise mechanisms that enable pets to elicit caregiving from humans are elaborated. They involve features that provide the initial attraction, such as neotenus characteristics, and those that enable the human owner to derive continuing satisfaction from interacting with the pet, such as the attribution of mental processes to human-like organisms. These mechanisms can, in some circumstances, cause pet owners to derive more satisfaction from their pet relationship than those with humans, because they supply a type of unconditional relationship that is usually absent from those with other human beings. © 1997 Elsevier Science Inc.

KEY WORDS: Attachment; Baby features; Evolutionary arms race; Manipulation; Pets; Social parasitism; Releasers.

Pet ownership is a very common human activity, and people lavish much affection and money on their pets. From a Darwinian perspective, it is a puzzling form of behavior, as it entails provisioning a member of another species, in return for which there are no apparent benefits connected to fitness. In this article, I first briefly review the evidence for the existence of strong attachments between people and their pets and discuss what forms these attachments take. I shall concentrate on cats and dogs, these being the most commonly owned

Received March 22, 1996; revised December 17, 1996.

Address reprint requests and correspondence to: John Archer, Department of Psychology, University of Central Lancashire, Preston, PR1 2HE, Lancashire, UK.

pets in the western world. Historically, they are also those with which humans interact most closely, as they are allowed to run freely in people's homes. I then outline why pet ownership poses an evolutionary problem and examine three attempts to account for it: these are the view that strong attachment to a pet indicates a poor capacity for human relationships, that it results from modern living conditions, particularly affluence, and that pet ownership confers benefits for health and psychological well-being. I shall argue that none of these provides a satisfactory explanation for the evolution of pet ownership, and I then consider the possibility that pets are, in evolutionary terms, manipulating human responses, that they are the equivalent of social parasites. I conclude that this is the most likely explanation, rather than some form of mutual benefit. The precise human mechanisms that allow them to be manipulated in this way are then discussed: they include both features that provide the initial attraction to the animal, and continuing features of the interaction with the pet that prove satisfying for the owner. The existence of such mechanisms, which have all evolved to enhance fitness within the context of human-human interactions, can, in some circumstances, lead to pet owners obtaining more satisfaction from their pet relationships than from those with humans.

THE INTENSITY OF PEOPLE'S ATTACHMENT TO THEIR PETS

Anecdotal accounts of the importance of people's emotional attachment to their pets are numerous. Extreme examples such as legal disputes over pet custody (Freedland 1994) and a dog being designated best man at a wedding (Hickrod and Schmitt 1982) attract the attention of the media, but there are many more commonplace examples of the enormous amount of affection, time, and money that people in modern western societies lavish on their pets. Examples include offering rewards when they are lost, paying for their grooming and health care, buying them presents, and, of course, feeding them. From a Darwinian perspective, this all adds up to fitness benefits being conferred on the pet; the fitness costs to humans (i.e., the effects on their reproductive success) are difficult to quantify, but it is reasonable to assume that the impact of such affection, time, and money being directed to pets instead of human kin would not be negligible.

There are a small number of systematic studies of the human-pet relationship in terms of attachment, a concept usually applied to close relationships between members of the same species, including humans (Ainsworth 1989; Bowlby 1969). Katcher et al. (1983) designed a 10-item questionnaire consisting of statements that would indicate positive attachment to a pet dog, such as carrying its photograph, letting it sleep on the bed, frequently talking to and interacting with it, and defining it as a family member. The scale was administered to 80 veterinary clinic clients. Although no conventional reliability statistics were carried out, frequency data for the individual items indicated high levels of attachment to the dogs. For example, 48% defined their dog as a family member, 67% had a photograph of the dog, 73% let it sleep in the bedroom, and 40% celebrated its birthday. Further analysis of these data

(Archer et al. n.d.) indicated that women showed stronger attachment to their pets than men did.

Lago et al. (1988) developed a "pet relationship scale" that was partly based on features indicative of attachment. Factor analysis revealed a main factor comprising items indicating affectionate companionship. Eendenburg (1995) used a single measure that involved people estimating their strength of attachment to the pet and estimating the average attachment people had to their pets. A coefficient was calculated from the ratio of their own attachment to the standard. Respondents showed the highest mean coefficients for dogs and cats. Most of this sample of more than 400 pet owners in The Netherlands said that they had acquired their pet for company and reported that its presence generated a sense of security. Serpell (1996) also used a single-item rating scale of attachment to pets and found that most of his sample of 37 dog owners and 47 cat owners said that they were very attached to their pets.

A more elaborate 33-item questionnaire measure of attachment to a pet dog was designed by Archer et al. (n.d.), on the basis of characteristics of human attachment. The composite measure showed strong attachment by many owners towards their dogs, with a considerable proportion endorsing individual items such as viewing the pet as an important part of their lives and one that provides a sense of comfort.

Studies of reactions to the loss of a pet can also provide evidence for the strength of people's attachment to their pet. Using the framework of attachment theory (Bowlby 1969, 1973), Parkes (1986) referred to grief as "the cost of commitment" to the lost loved one—in other words, an indirect measure of the strength of attachment. The process of grief involves the emotional distress, thoughts, and feelings that accompany the slow process of mentally letting go of an established relationship. Both anecdotal and systematic evidence indicates that there are clear parallels between the sort of reactions people show to the loss of a pet and to the loss of a human relationship.

Anecdotal evidence, from the U.S. and the U.K., includes newspaper reports (Graves 1994; Haddon 1994), psychiatrists' case histories (Keddie 1977), surveys of veterinarians (Stewart et al. 1989), and reports by people who specifically counsel bereaved pet owners (Carmack 1985). Studies in the U.S., the U.K., and Israel of the situations in which people say they would cry, have revealed substantial numbers of respondents—male as well as female—who say they would cry after the death of a pet (Lombardo et al. 1983; Williams and Morris 1996).

Several specific investigations of grief following pet loss have been undertaken. Earlier studies (Quackenbush 1984, 1985; Stewart 1983) have tended to be mostly qualitative in their descriptions, showing parallels between grief following human death and to death of a pet. Stewart (1983) reported that a minority of her sample (18%) were so disturbed that they were unable to carry on with their normal routine, and a third described themselves as very distressed. Dunn et al. (1992) studied a sample of nearly 1,000 bereaved pet owners in the U.S. and found that grief was brief but intense. Sadness was still apparent in over half the sample 1 month after the loss, and crying and guilt in approximately a quarter.

Archer and Winchester (1994) incorporated aspects of the grief reaction known from studies of human grief (Parkes 1986) into a 40-item questionnaire, which was

completed by 88 British respondents who had lost a pet during the previous year. Many of the items were strongly endorsed by a majority of the sample: for example, 74% said that their thoughts returned again and again to the lost pet, and 60% said that they felt drawn towards animals that reminded them of their lost pet. Nevertheless, compared to what we would expect in the case of human bereavement, there was a smaller proportion who felt depressed or anxious or angry as a result of the loss. Similarly, in a large sample survey of mid-life couples in the U.S., Gage and Holcomb (1991) found that death of a pet was perceived as less stressful than the death of an immediate family member or a close friend. In another large sample, of older people in the U.S., Rajaram et al. (1993) found that the death of a pet was associated with much lower depression levels than in the case of a significant other, such as a spouse.

In contrast, two other U.S. studies, using an adapted version of scales designed for human grief (the Grief Experience Inventory [GEI]; Sanders et al. 1985) found that the levels following pet loss were comparable with those found after the loss of a human loved-one. Drake-Hurst (1991) compared the grief responses of people who had lost a pet with those who had lost a spouse and found no significant differences on 9 of the 12 GEI scales. Gerwolls and Labott (1994) carried out a longitudinal study of grief following pet loss and found that the values were comparable with standardized figures for loss of a parent, child, or spouse (Sanders et al. 1985).

Archer and Winchester (1994) devised a crude assessment of the person's emotional attachment to their pet and found that this paralleled the total grief score obtained from the questionnaire. Other studies (Gerwolls and Labott 1994; Gosse 1989; Gosse and Barnes 1994) have also found that assessments of the strength of attachment to the former pet predicted measures of grief intensity. These findings support Parkes' general position that the intensity of grief indicates the strength of attachment—in other words, "the cost of commitment."

There is therefore evidence from several sources that attachment to pets can be intense, and that the breaking of the bonds can, in some cases, induce a grief reaction of comparable severity to loss of a close human relationship. The existence of such attachments to pets does, of course, exist alongside caring and providing for them and provides the proximate reason why humans are willing to do this.

WHAT TYPE OF ATTACHMENT DO PEOPLE HAVE WITH THEIR PETS?

Attachment theory arose out of research on the nature of the child's tie with his or her parents (Bowlby 1969, 1973), but it has now been extended to other relationships people have with their loved ones (Ainsworth 1989; Bowlby 1969; Hazan and Shaver 1987; Weiss 1988). Thus, both the feelings of the parent for the child as well as those of the child for the parent are covered by the term attachment.¹ In the former case, the dominant feature is caregiving or protecting, and in the latter it is

¹But see Ainsworth (1989), who seeks to restrict the use of attachment to child to parent bonds, and to refer to the general category as "affectional bonds"; this is, however, a departure from Bowlby's original inclusive use of the term, and from the way the term is used by researchers on adult attachment such as Weiss (1988), Hazan and Shaver (1987) and Berman and Sperling (1994).

using the other as a source of security and protection. Relationships between adult sexual partners contain elements of both (Ainsworth 1989; Vormbrock 1993).

There is convincing evidence that people usually view their relationship with pets as similar to those they have with children. Pet owners treat pets like children, for example, playing with them (Smith 1983), talking to them in motherese or baby-talk (Hirsh-Pasek and Treiman 1982), continually referring to "my baby," and holding and cuddling them as one would a baby (Carmack 1985; Serpell 1986). Berryman et al. (1985) administered a repertory grid to 30 pet owners, using as elements eight individuals, six people, and two pets (current and previous), and as constructs aspects of human relationships such as dependence, fun, and the importance of the relationship. They found that pets were viewed as closest to "own child" among the human elements. Similar (but less systematic) evidence that pets act as child substitutes can be found from anthropological and historical accounts of other cultures: this includes breast-feeding of young animals by humans (Messent and Serpell 1981; Savishinsky 1983; Serpell 1986, 1987).

There is, however, evidence that pets can also be used as parent or partner substitutes (Albert and Bulcroft 1987). For example, it is apparent from cross-cultural surveys of pet ownership (Savishinsky 1983) that pets serve a variety of roles in addition to that of surrogate children. One veterinary researcher has even set out the theory that dogs are primarily used as parent substitutes (O'Farrell 1994). In the study of attachment to pet dogs referred to above (Archer et al. n.d.), we included in our questionnaire both the caring (i.e., child substitute) aspect of attachment and the source of security (i.e., parent substitute) aspect. In one sample, we found a factorially distinct group of items indicating that the dog was fulfilling an emotional need. Responses to several of the specific items showed that the dog was being used as a source of security in the way that children use parental figures: for example, "I enjoy feeling my dog sitting close to me," "When upset or anxious I turn to my dog for comfort," and "I hate going home when my dog is not there to greet me." Similarly, the sample of pet owners studied by Endenburg (1995) reported a sense of security from the presence of their pets.

We can conclude that, although in general there is evidence to support the commonsense idea that pets are baby and child substitutes, in the case of dogs the nature of the bond is such that it may also contain a strong element of reassurance and a feeling of security; there are, therefore, aspects of a substitute companion or even a parental figure.

WHY PET OWNERSHIP IS AN EVOLUTIONARY PROBLEM

The evolutionary significance of the attachments formed to other humans is clear, since they serve obvious biological functions such as shared parenting, or aiding relatives, or forming mutually beneficial alliances. This raises the question of why people should form similar attachments to members of a different species. Three possible answers to this question are considered, before examining pet ownership from the perspective of comparative zoology. From this analysis, a fourth possibility ("manipulation") is considered to be more plausible. The first two explanations to be considered were referred to as "popular beliefs and misconceptions" by Serpell

(1987). In both cases, pet ownership is regarded as maladaptive behavior. One explanation focuses on the individual's psychological difficulties. The other concentrates on the general impact of modern environmental conditions. A third explanation regards pet ownership as beneficial, and, therefore, by implication adaptive for modern-day pet owners. In the course of discussing these views, I shall argue that all three are incorrect, which leads us to consider pet ownership from a wider comparative perspective.

IS PET OWNERSHIP A RESULT OF DEFICIENT HUMAN RELATIONSHIPS?

One common view, particularly among those who do not themselves have pets, and even among some who do, is that strong feelings directed towards a pet are an indication of some inadequacy in the person's relationships with humans. Commonly, this judgment is applied to a woman who lives by herself, has no children, and dotes on her pet dogs or cats. It can be found in the comments of some psychiatrists about patients who show strong attachments to their pets (Keddie 1977; Rynearson 1978). It can be seen in a more general form in the attitude that any show of emotion over a pet is a sentimental indulgence. In a poem called *In memory of our cat Ralph*, Garrison Keillor (1989) describes such feelings that he and his family felt when their cat died, and then goes on to ask whether it is not "a childish weakness, to regard/An animal whose life is brief/With such affection and such grief."

Serpell (1986, 1987) has argued strongly against the view that pet love betrays signs of emotional immaturity and weakness. He suggested that this attitude to pet keeping has arisen as a consequence of the general way animals have been viewed in the Judeo-Christian tradition of Western Europe, in other words, that they were created specifically to serve the interests of humans who have dominion over them. He also argued that attachment to a pet is too widespread a phenomenon throughout history and in the modern world for it to be viewed as an abnormal response by some inadequate individuals. This viewpoint is considered further in the next section.

Also supporting Serpell's argument are a number of studies indicating more positive personality characteristics among pet owners than nonowners (Joubert 1987; Kidd and Feldman 1981; Paden-Levy 1985), although in some cases the differences are only marginal (Hyde et al. 1983), and there are contrary findings (Cameron and Mattson 1972).

There is also some preliminary evidence that people who have more secure attachments in their close relationships with other adults are the ones who are most strongly attached to their dogs (Archer et al. n.d.). This is the reverse to what we would expect if strong attachment to a pet resulted from difficulties in forming relationships with adult humans.

IS PET OWNERSHIP A CONSEQUENCE OF MODERN LIVING CONDITIONS?

Another popular belief (Serpell 1987) is that pet ownership has arisen specifically in the modern western world. A related view is that it might be associated with the

individualism of modern western societies with its emphasis on romantic love (Triandis 1995).² Such suggestions may have superficial appeal in view of the apparently greater popularity of pet keeping in affluent western societies. However, as Serpell (1986, 1987) has convincingly argued, it is a view that cannot account for the more widespread occurrence of pet ownership, both geographically and historically, as indicated by archeological, historical, and anthropological evidence.

The association between humans and dogs is an ancient one. There is fossil evidence for an association between *Homo erectus* and a wolf-like canid half a million years ago (Messent and Serpell 1981). Evidence for the domestication of dogs goes back to beyond 12,000 years ago (Clutton-Brock 1977; Musil 1970). Davis and Valla (1978) described three canid finds from the Natufians, hunter-gatherers in Israel 12,000 years ago, including a puppy buried with a human who was placed with his hand around the dog. Comparative evidence indicates that the specimen was likely to have been a domesticated dog rather than a wolf, and the arrangement of the burial provides, in the authors' words, "proof that an affectionate rather than gastronomic relationship existed between it and the buried person" (p. 610). Such early fossil evidence has led several reviewers to argue that the domestication of dogs may have begun with keeping them for pets rather than for other purposes (Clutton-Brock 1977; Messent and Serpell 1981; Savishinsky 1983). There is also present-day evidence that dogs may be kept by hunter-gatherers and yet not be used for hunting (Messent and Serpell 1981).

The western-centered view of pet ownership is also inconsistent with the available historical and anthropological record (Messent and Serpell 1981; Savishinsky 1983, Serpell 1986, 1987). Pet ownership is, and has been, widespread in many different societies. It was, for example, common among the ruling classes of ancient Greece and Rome, and among rulers in Europe, China, Japan, and Africa. It became more widely distributed across social classes during the last century, although it may have been common among poorer people before then. From accounts by the early European explorers to those of more recent anthropologists, the available evidence indicates that pet keeping commonly occurs (and has occurred) in tribal societies, for example, in North and South America, and in Australia. Although the evidence is not as quantitative and systematic as that for modern western societies, the descriptions are sufficiently consistent and unrelated to any ideological concerns for us to accept their overall impression, that pet keeping was and is widespread. As Serpell (1987) noted, anthropologists have recorded, but have generally not attempted to explain, the wide distribution of pet ownership. He argued that a narrow explanation, related to modern western conditions, could not account for this wide occurrence of pet ownership, since a clear distinction is made between pet animals and those used for food or work in all societies for which there is evidence. Throughout the descriptions of pet keeping in traditional societies reviewed by Serpell (1986) is a clear sense of love and affection towards pets, which is familiar from our own experiences of pet ownership. Indeed, the physical manifestations may go

²This possibility was suggested by a reviewer of this paper.

further, with reports of owners eating the fleas off pet dingoes, and women from several societies suckling the young of species kept as pets.

DO MODERN CONDITIONS ACCENTUATE ATTACHMENT TO PETS?

Although I have argued against both the view that pet ownership is a compensation for a poor *capacity* for human relationships and that pet ownership is a product of western culture, it may nevertheless be the case that the social arrangements in modern western societies accentuate the bonds people form with pets. Family sizes tend to be small, owing to the demographic transition, and this has been exacerbated by a breakdown of extended family living (and to some extent of the nuclear family itself). The trend for smaller household units has reached its logical conclusion with larger numbers of people living alone. Is there evidence that these social arrangements foster closer attachment to pets?

There are indications of greater attachment to pets among those with fewer close human ties, such as single and divorced people, when compared with families with children (Albert and Bulcroft 1987). Women living alone were found to be significantly more lonely than those with pets or those living with other people (Zasloff and Kidd 1994). A German study of single people with cats found that they played with them for longer than did cat owners with a close human relationship, and they were more strongly attached to their cats (Bergler and Loewy 1992). The distress following pet loss has been found to be greater for those living alone than for those sharing a household with others (Archer and Winchester 1994; Carmack 1985) and to be inversely related to family size (Gerwolls and Labott 1994).

Therefore, although there is no evidence that people with deficient capacity for adult human relationships turn to pets as substitutes, those whose circumstances have led to them living alone or without children do seem to be more strongly attached to their pets.

The living arrangements of modern western societies contrast greatly with those in more traditional societies, for example, with life in Indian cities where there are extended family networks living together with relatively little space and privacy. These structural differences are associated with psychological differences, with what amounts to a different outlook on life. Laungani (1994) has described the differences in terms of western society emphasizing individuality, rationality and control, free will, and materialism, whereas Indian society emphasizes communal values, emotional expression, determinism, and spiritualism (cf. the distinction between individualistic and collectivist societies made by Triandis 1995). These differences affect a wide range of people's activities and beliefs. They lead us to ask whether pet ownership may be accentuated in the affluent west today, because it is fulfilling emotional needs that at other times and in other places are directed primarily (but not exclusively) to an extended family network, including a larger number of infants and children.

The cross-cultural and historical evidence (Serpell 1986, 1987) certainly indicates that pet ownership is prevalent even when extended family networks are

present, and that differences in pet keeping among different cultures is more associated with different traditions and beliefs about animals than the extent of family networks, or the individualist-collectivist dimension. Nevertheless, within a particular cultural tradition, the existence of fewer social contacts would seem to accentuate attachment to pets.

THE BENEFICIAL CONSEQUENCES OF PET OWNERSHIP

Serpell (1987) commented that the rewards of pet ownership must be “far from negligible” in view of its occurrence beyond the affluent classes and present-day affluent societies. This still leaves us with the question of what such rewards might be. There is now a rapidly developing literature on the beneficial correlates of companion animals for health and well-being (see Friedmann 1995 for a summary). Compared to nonowners, pet owners are found to show significantly reduced physiological risk factors for cardiovascular disease, such as plasma cholesterol and triglyceride levels, and systolic blood pressure (Anderson 1992; Anderson et al. 1992). These differences could not be attributable to confounding variables such as socioeconomic status, body weight, or smoking habits (Anderson 1992). Among patients who had been treated for myocardial infarction or angina pectoris, pet ownership was significantly associated with lower mortality 1 year later (Friedman et al. 1980); this association remained even when dog owners were removed, to control for their additional exercise. Pet owners also show less intense reactions to stress (Bergler 1992), fewer psychosomatic symptoms (Bergler 1992), and fewer visits to medical practitioners than nonowners (Siegel 1992), a finding that was attributed to the stress-buffering effect of pet ownership. Other studies show the direct effects of interacting with a pet (e.g., stroking it) on physiological measures indicative of relaxation, such as heart rate and blood pressure (Lysons 1992). A sample of children in an experimental situation where they were asked to read aloud showed comparable lowered blood pressure and heart rates when a friendly dog was present (Friedmann et al. 1983).

A 10-month prospective study (Serpell 1991) examined changes in health and behavior following acquisition of a dog or cat and in a control group without pets. Pet owners showed a highly significant reduction in minor health problems and improved scores on a standardized questionnaire, the General Health Questionnaire (Goldberg and Williams 1978). These effects were more prolonged among dog than cat owners.

Arguing from such evidence, Serpell (1986) stated: “Indeed it would be fair to argue that pet-keeping is genuinely ‘adaptive’ in the evolutionary sense of the word, since it contributes to individual health and survival by ameliorating the stresses and strains of everyday life” (p. 119). This explanation raises two issues: first, whether the health benefits are sufficient to make a discernible contribution to reproductive success; and second, whether they would outweigh the often high cost of feeding and caring for the animal.

The first issue is difficult to answer from the current evidence, which concerns apparently minor benefits in health and well-being, or recovery from heart disease,

which is characteristic of later in life. A link with reproductive success remains to be established.

In relation to the second issue, I have already outlined the extent of the resources and affection that are devoted to pets. The large industries that supply their real and imagined needs are an indication of the high material cost collectively paid by pet owners. Where resources are not abundant, the costs of pet keeping will be higher in relative terms and could be detrimental to fitness. In a poor household we might consider keeping a pet dog alongside infants or small children as akin to smoking in terms of its costs for the offspring: it diverts money and time that could be spent on them and increases their health hazards. In general terms, the Darwinian issue is whether the amount of food, time, and energy that is devoted to the pet would be more profitably spent caring for offspring and relatives. Only if this proves to be less than the advantages in terms of health and well-being of keeping pets can the adaptive explanation of pet keeping be sustained. However, quantifying the *fitness* costs and benefits for human behavior of any kind is notoriously difficult. In the case of pet keeping, it is likely to vary among different individuals and categories of individual. In any individual case, there will be additional complications, such as benefits other than those related to health and well-being, for example, as aids to the play and socialization of children.

From the perspective of comparative zoology, pet keeping is a form of social symbiosis (Wilson 1975),³ meaning that there are prolonged and intimate relations between animals of different species. The important issue is into which of three major categories of symbiosis it belongs. This depends on the mutuality of the net benefits: mutualism benefits both species; commensalism benefits one, but is neutral to the other; and parasitism benefits one species at the expense of the other. If, as Serpell argued, there are genuine benefits that exceed the costs of pet keeping, it is mutualism; if the costs and benefits to humans are about the same, it is commensalism; if the benefits outweigh the costs for humans, it is parasitism. I am here assuming that it is accepted that domestic dogs and cats have benefited enormously in terms of reproductive success from their association with humans: their populations have become many times more frequent than they would have been had their human owners not fed and cared for them. For example, in the U.K., the cat population is so numerous that it has a significant effect on the wildlife population as a result of deaths through predation (Churcher and Lawton 1987).

PET OWNERSHIP: MUTUALISM, COMMENSALISM, OR PARASITISM?

Serpell's argument that pet keeping is a form of mutualism puts it into the general category of one species deriving a resource as a result of caring for a member of another species. Humans have used animals in this way throughout history, for

³As Wilson (1975) indicates, there is different usage of the term "symbiosis" among North American and European zoologists. I am using the American definition, which includes all forms of interspecific relations, as opposed to the European one, which uses the term symbiosis to mean only those relations where there is mutual benefit.

transport, clothing, and shelter, in military campaigns, and of course for food. A nonhuman example of mutualism is provided by those species of ants that protect aphids from predators in return for obtaining a sugary solution called honeydew from the aphid's anus (Diamond 1991: 165). Arguments against placing pets in this category were presented above, namely, that the suggested benefits appear to be minor compared with costs. Other examples of mutualism all involve major and obvious benefits, usually tangible resources, being derived from the other species. Moreover, humans adopt very different value systems towards those animals that are kept for utilitarian purposes and those that are kept as pets (Serpell 1986).

Social commensalism usually involves individuals inserting themselves into the social system of another species in an unobtrusive fashion (Wilson 1975), for example, by becoming scavengers. It is likely that the relationship of humans to domestic animals began in this way, since providing food surplus to requirements would have no cost. However, this is different from animals of different species forming emotional bonds with one another, as is the case with humans and their pets.

In the case of social parasitism, one species manipulates the other's behavior to obtain a benefit. The benefits are largely or entirely one way. For example, the beetle *Atemeles* manipulates the caring responses of ants, thus enabling it to become a social parasite in the ant colony (Wilson 1975). The cuckoo and many other avian brood parasites rely on a host bird, such as the reed warbler (Davies and Brooke 1988), showing parental responses to any nestling with a gaping bill: countermeasures have not evolved either through the time span involved or because their cost would be too great relative to the gains from reduced parasitism (Davies and Brooke 1988).

Material benefits are provided by human owners for their pets, and pets do not contribute in a practical way to their owners' well-being. Objectively, this would seem to place pet ownership into the category of social parasitism, raising the question of whether the pet is, in evolutionary terms, manipulating the human parenting responses to enhance its fitness. There seems to be a strong resistance to this explanation among those who emphasize the health and well-being benefits conferred by pets. It was rejected by Serpell (1986), despite a chapter outlining the apparent similarities of pet keeping to well-known examples of social parasitism.

Serpell's argument against this view identified little in the way of concrete benefits arising from pet keeping, at least of the sort that would have aided inclusive fitness in the ancestral environment. It also confused an ultimate functional view with usefulness in terms of an immediate feeling of well-being, much of the discussion being taken up with establishing that pets fulfil a genuine need for affiliation and love in humans.

Despite any perceived benefits people may obtain in terms of the loving and pleasant feelings they derive from interacting with their animals, such feelings by themselves provide no benefits in a Darwinian sense. They do not enhance fitness, but are (usually) cues to situations that led to enhanced fitness in the evolutionary environment. Feeding a cuckoo chick is probably also a rewarding activity for a reed warbler and may likewise fulfil a need for nurturance, but this does not make it adaptive in an evolutionary sense. It seems unlikely that emotional bonds that are usually formed with offspring, parents, or other close kin, or with sexual partners, would be extended to another species unless that species is engaged in evolutionary

manipulation, since emotional bonds commit the individual to care over a long period of time irrespective of immediate fitness considerations.

I would therefore argue that, in evolutionary terms, pets can be considered to manipulate (Krebs and Dawkins 1984) the human species. They are similar in this regard to social parasites, such as the cuckoo, which rely on the generalized behavioral dispositions of another species, such as the reed warbler (Davies and Brooke 1988) to obtain resources for themselves. The term *manipulation* is, of course, not meant to imply any conscious intent. What it does in evolutionary terms is to impose a fitness cost on the human host—not, of course, as much as in the case of the cuckoo, but an appreciable one nevertheless.

Having said this, it must be admitted that pets are an unusual form of social parasitism, for at least two reasons. One is that the arrangement can be (and sometimes is) terminated by the host if the perceived costs become unacceptable (for example, if a dog attacks a young child or persistently defecates in the house). A second is that the association depends upon initiatives by the host species. Young of suitable species are typically adopted by humans, and, over the history of pet keeping, they have been modified so as to fit in better with human needs and lifestyles. Dogs have been domesticated, tamed, and socialized by humans, the host species. Nevertheless, when considering which species has obtained an evolutionary benefit from the association, it is clearly the pets.

THE MECHANISMS UNDERLYING MANIPULATION: SOCIAL RELEASERS

If this analysis is correct, it raises the obvious question of why humans began keeping pets and go on doing so. Examining other cases of social parasites may help illuminate the mechanism underlying this possible evolutionary manipulation of human behavior. The best-known examples are brood parasites among birds and a more total form of parasitism in some insect species (Wilson 1975).

Brood parasitism has evolved in about 80 bird species, and it involves various devices to intimidate or trick the hosts into accepting their eggs and nestlings, the latter relying on the host's behavioral reactions. For example, a cuckoo chick in a reed warbler nest is fed because the host parent is responsive to any gaping bill in its nest, even when this does not (as in the case of the cuckoo chick) resemble that of a reed warbler chick (Davies and Brooke 1988). The parent is seemingly programmed to respond in a fairly automatic way by feeding any pair of gaping jaws in its nest. It has even been suggested (Dawkins and Krebs 1979; Wickler 1968) that the cuckoo provides a supernormal stimulus, one more potent than that supplied by a reed warbler chick. However, choice experiments have demonstrated that parents show similar preferences for chicks from their own and from the parasitic species (Davies and Brooke 1988).

Inquilism is a form of permanent social parasitism found in ant hosts, when the parasite species has become dependent on the host throughout its life. There is increasing morphological and behavioral specialization for manipulating the host. Wilson (1975) commented that inquilines such as the beetle *Atemeles pubicollis* have

“broken the code of the social insects” (p. 375) in that they use two or three imitation pheromones and two tactile stimuli to penetrate and live in the ant colony. They rely on a limited number of stimuli controlling the social behavior of the host species, and Wilson commented on the strikingly different appearance of the parasite and host.

In both examples, manipulation is made possible because of the way in which the host’s behavior is controlled. Responsiveness to a relatively simple set of stimuli (termed *social releasers*: Hinde 1982) enables important activities such as parental care to occur without a long period of learning. They are widespread throughout the animal world. But since they are automatic responses to simple stimuli, they are set off relatively indiscriminately and, hence, are open to manipulation.

Wilson (1975) shared with one of the pioneers of the study of social parasitism the opinion that this manipulation of the host’s behavior appears very bizarre from a human standpoint. He quoted the following comment on inquilism from Wheeler (1923): “Were we to behave in an analogous manner we should live in a truly Alice-in-Wonderland society. We should delight in keeping porcupines, alligators, lobsters, etc., in our homes, insist on their sitting down to table with us and feed them so solicitously with spoon victuals that our own children would either perish of neglect or grow up as hopeless rhachitics”⁴ (p. 221). As Serpell (1986) recognized, if we substitute dogs and cats for porcupines, alligators, and lobsters, and consider less extreme forms of care for them, we end up with a picture rather similar to human pet-keeping. This leads us to ask whether there are human releasers that could have brought us, at least part of the way, to Wheeler’s Alice-in-Wonderland society.

The possible existence of social releasers in humans has been hotly debated. There is, however, considerable agreement (and considerable evidence: Archer 1992: 82–90) that humans respond in a parental way to certain sets of facial and bodily features found in human infants. These features make most of us go “ah” and “coo,” and regard their owner as “cute” or “sweet.” Lorenz (1943, 1971) originally suggested that these features, a large forehead, large and low-lying eyes, chubby cheeks, short and thick limbs, and clumsy movements, were the human equivalent of the social releasers found in other animals. He also suggested that the young of most bird and mammal species share the same features, so that humans also find 1-day-old chicks, kittens, and puppies cute. It is also why we are attracted to cartoon characters such as Bambi and Mickey Mouse (Gould 1980) and to cuddly toys such as teddy bears (Hinde and Barden 1985). These, unlike the cuckoo chick (see above), may be examples of supernormal stimuli, in that they have improved on nature by having the relevant stimuli exaggerated beyond that found in young animals.

Lorenz also suggested that the same facial configuration forms the basis of human’s attraction to those pets we treat like children: when breeding lapdogs, humans have selected such features. In this way, one of the two most common parasitic species shows morphological and behavioral modifications for more effectively exploiting the host, in this way paralleling other social parasites (Davies and Brooke 1988; Wilson 1975). Thus, the adult Pekinese or King Charles spaniel has the typical infant features present in the young of other breeds. Other types of small dogs

⁴One who has rickets.

show intermediate characters, partially reflecting their utilitarian origin. We should, however, note that systematic research of this subject is lacking: there are, for example, no comparative studies of breeds of dogs in terms of their possession of baby features (which can be quantified: e.g., Hinde and Barden 1985), and no studies of whether their preference ratings would follow the extent of the baby features. It would also be interesting to examine whether pet owners and nonowners differed on such ratings.

The idea that humans respond to a set of features that release parental feelings may explain why certain types of pets are chosen by their human owners. But there is much more to it than this, since some animals that do not have these features are nevertheless acceptable as pets, and the mere possession of such features does not guarantee the acceptance of an animal as a pet.

OTHER FEATURES INFLUENCING ACCEPTABILITY OF A PET

There are two other considerations. The first is that the existence of baby features is only part of what humans find appealing in a pet. There is a range of background features that make some animals acceptable and others not: people tend to choose animals of a certain size and intelligence. They tend to choose mammals because they are—like us—warmblooded and feel better to the touch. They also tend to prefer those with fur: furless mammals such as the naked mole rat or the Canadian hairless cat appear to be off-putting to most people: why this should be so is puzzling, unless of course hairlessness is a fairly recent feature in human evolution. In contrast to the attraction felt for many mammals, many people show feelings of disgust or fear to a wide range of invertebrates.

There are, of course, also practical considerations. Some animals that look cute because they have the baby features, such as pandas, owls, and penguins, are ruled out as pets because they would not be safe or suitable to keep in our homes. Humans need animals that can be accommodated to their way of life. They must be active at the same time of day that we are (Serpell 1986). They must not urinate or defecate in the house, they must not attack their owners or their friends, and they must not eat the furniture. Inability to be trained in these ways rules out a wide range of potential candidates as pets, including most nonhuman primates. They must be able to be tamed and socialized and to show social responses to humans. Finally, among those we might keep as pets, the cat and the dog have come to be the most popular because they not only fulfil the requirements of trainability but also through their historical availability (Messent and Serpell 1981). They may have already been associated with humans as semidomesticated animals for other purposes, or possibly pet keeping may have pre-dated other uses of these animals (Clutton-Brock 1977; Serpell 1986).

DEVELOPING A BOND WITH A PET

The features outlined in the previous two sections make pets appealing and enable their owners to feel comfortable with them in the first place. But there is far more to

the development of a bond with the pet than this. Like the appealing characteristics of a human infant, or the attractive looks of a potential sexual partner, the initial appeal of the pet arouses the owner's interest and sets off the subsequent train of interactions. Studies of human attachment (Bowlby 1969) have identified the importance of exposure learning—simply being there in one another's company—together with the interactions being reciprocal and mutually satisfying. People have to get enjoyment out of their interactions to form a close relationship with the other person. In the case of the sexual bond and the child–parent bond, this enjoyment is based on dispositions that are part of human nature.

The interactions people have with pets are a modification of those they have with people. Dogs and cats are mammals whose emotions and moods are similar to those of humans, although the ways they express them are different. Oskar Heinroth, one of the pioneers of the ethological tradition, described animals as “emotional people of extremely poor intelligence” (Lorenz 1970). He is right to the extent that it is the emotional similarity that people recognize in animals. This forms the basis of being able to communicate with them by visual and auditory signals, and by touch (the equivalent of grooming), and to share object play with them (Smith 1983).

Cats and dogs behave in ways that are appealing to their human owners (Serpell 1986, 1996). Dogs show obvious signs of affection and attachment to their owners, and they are very attentive to them (Smith 1983). Cats, although more independent, appear to like being stroked and petted by their owners. Pets therefore appear to treat their owners with love and affection.

Serpell (1983) analyzed a series of semistructured interviews with 25 dog owners for recurrent themes regarding the qualities of their pets. These were used to construct a questionnaire that was given to a second sample who rated their own and their ideal dog on these features. Certain features were near to the maximum on the scale and not significantly different for their own and ideal dog. These characteristics were expressiveness, enjoyment of walks, loyalty and affection, welcoming behavior, and attentiveness. Serpell argued that these features are at the heart of the relationship with the dog. In the study by Berryman et al. (1985) analyzing the similarities and differences between relationships to pets and to people (see above), they found that the most salient characteristics of the relationship with the pet were dependence, fun, play, and relaxation based on absence of demands. Pets were therefore seen as dependent, but also as a source of fun and play; that is, they possessed some of the features that make relationships with children satisfying.

OVERCOMING THE PET'S INTELLECTUAL AND LINGUISTIC LIMITATIONS

One potential obstacle to forming a human-like relationship with an animal is its limited intellect and lack of language. Nevertheless, pet owners behave *as if* the pet can understand them and talk to them. Among a sample of 80 people from veterinary clinics, Katcher et al. (1983) found that 79% said that they talked to the animal as if it

were a person and 80% believed that the pet was sensitive to the owner's feelings. A smaller-scale observational study by Smith (1983) has validated these survey data.

Language directed towards babies and young children shows a number of specific characteristics that marks it out from the language used with other adults. It is referred to as motherese and consists of a number of features, such as short utterances, with many imperatives and questions, repetitions, simple sentences, and tag questions ("aren't you" at the end). Hirsh-Pasek and Treiman (1982) examined recordings of dog owners talking to their dogs for such features, comparing the type of language used with the dog to that used in conversations with adult humans. They found that nearly all the characteristics of motherese were present in these one-sided conversations with the pet dogs. These findings suggest that a pattern of language presumably first used to aid interactions (and then to initiate conversations) with young children has readily been co-opted for interacting with other social beings who are, like infants, presumed to be at a lower level of understanding than adult humans (although this may not always be the reason for speaking motherese, since it is also used in adult intimate relationships: Bombar and Littig 1996).

The human tendency to project feelings and thoughts onto animals, and even onto inanimate objects such as robots and computers, would seem to be a pervasive one. It is probably based on what developmental psychologists call "the theory of mind," which means the ability to impute a mental state to others (Baron-Cohen 1992). This develops between 3 and 4 years of age and is lacking in people with autism. Most humans see others as having minds, that is, feelings, beliefs, and intentions different from their own. However, one by-product of this ability is that they tend to overattribute, and in the case of animals this leads to anthropomorphism. Anything that is similar to a human being, and with which a person has repeated interactions, is treated *as if* it has a "mind." The human brain also operates so as to construct coherent and consistent representations of the outside world, filling in the gaps and ambiguities in reality. A combination of these two features enables people to interact with their pets as if they were humans and to form relationships that come to be like those formed to humans.

PREFERRING PETS TO PEOPLE

Some owners may take this process even further and attribute features to their relationships with animals that are valued more than human relationships. In modern western societies, human relationships often produce difficulties and dissatisfactions. In such circumstances, pets may provide relationships that are compared favorably to those with humans. Surveys of veterinary practitioners in the U.S. indicate that some pet owners say that they would rather lose their spouses than their pets (Carmack 1985). In one sample from the questionnaire study of dog owners described earlier (Archer et al. n.d.), over half agreed with the statement that the loss of their dog would mean as much to them as the loss of a family member or friend. Some people made favorable comparisons with human relationships in their spontaneous remarks: for example, "I care for them more than for most people I know,"

and “My dogs play a major part in my life and always have done so. As a child the dog was the only member of the family who could make life worth living.”

In other comments, the person elaborated just what it was about the relationship with the dog that made it preferable to a human being. It was always there, always loving, and completely uncritical. In other words, the relationship with the animal—because it is largely based on attributed positive features—manages to avoid those conditional and judgmental features that are so inconvenient in human relationships. As one respondent in the dog-attachment study put it: “They love me even without make-up.”

In counseling terminology, this sort of uncritical acceptance is known as *unconditional positive regard* and is associated with the ideas and therapeutic methods of Carl Rogers. It is not surprising, therefore, that this aspect has been used as an adjunct to therapy, following Levinson (1962), who described the use of a dog as a “co-therapist” in treating disturbed children. The dog had the advantage of not “talking back” when the child shouted at it. More recently, Ruckert (1987) has published a more extensive manual called *The Four-Footed Therapist*, which “teaches you how to use your animal as a counsellor” (p. 2). Again, the methods are based on the notion that, unlike humans, pets are always “loving, available and uncritical.” As Ruckert puts it: “Your pets believe that as their master, you are the most wonderful person in the world.” One American psychologist put it more aptly when he said: “All dogs have read Carl Rogers.”⁵ Of course, the reality of the situation is that the sense of unconditional positive regard is constructed by the pet owner (and by the therapist) from the interaction with the pet. Nevertheless, it may still be useful and beneficial for the individuals concerned.

Owners extend the anthropomorphism towards their pets in other ways, including giving them individual names, feeding them at meal times in their own bowls, taking them to a medical practitioner when ill, and in many cases celebrating their birthdays (Archer et al. n.d.; Katcher et al. 1983), allowing them to sleep on the owners’ beds (Carmack 1985; Katcher et al. 1983), and even on occasions dressing them up like humans. These actions all help to cement the perception of a human-like relationship with the pet.

CONCLUSIONS

Why *do* people love their pets? In answering this question, we had to separate the ultimate Darwinian explanation from the proximal mechanism through which people develop attachments to their pets. As we have seen, these attachments are often strong ones when judged by the standards of human attachments. I argued that, in evolutionary terms, humans are manipulated by pets: they are cuckoos in our nests, albeit not as destructive to our own offspring as are cuckoo chicks.⁶

⁵I have been unable to trace the original source of this remark. It was told to me by someone at the Fourth International Conference on Grief and Bereavement in Contemporary Society, Stockholm, June 1994.

⁶Serpell (1986) described a British newspaper report of a rotweiler that killed its owner’s infant. The owner was reported to be more upset at the prospect of the dog being killed than about the loss of the baby, saying that she could always have other babies but could not replace that particular dog.

The proximate mechanisms through which pets achieve their evolutionary manipulation of the human species consist of a number of features that make our interactions with them potentially rewarding. However, reward and positive feelings are not, in this case, equivalent to enhancing fitness, as all of these features were originally evolved to aid relationships with other humans, principally offspring and sexual partners. They include the dispositions humans possess to respond nurturantly to infant and child-like features. Mammalian pets also possess certain human-like behavioral features, notably their emotional reactions, which enable people to interact with them as if they were human family members. Because of the ability to attribute mental states to individuals with human-like behavior, humans are able to fill in the enormous gap between themselves and nonhuman animals in terms of language and thought. They therefore attribute human feelings and thoughts to the pet, thereby setting up a perceived relationship with it. The formation of such relationships is likely to be accentuated where people have fewer or less fulfilling human relationships. Finally, some people may greatly value the relationships with their pets because they supply them with the type of unconditional adoring relationship that has eluded them (and indeed most of us) when other human beings are involved.

Underlying all this are human dispositions that originally helped people to care for their children, to form relationships with mates and kin, and to show empathy with other human beings. They have become used in a very different way, one that people find emotionally satisfying but, in evolutionary terms, benefits the pets at the expense of their human owners.

LIMITATIONS

Although I have argued that pets are, in Darwinian terms, a form of social parasite, this argument is derived from an analysis of different kinds of available evidence, which is incomplete. Current research on pet keeping has concentrated on short-term benefits to health and well-being. There may be additional benefits that are hard to quantify, such as the contribution to children's psychological development, longer-term effects on self-esteem and well-being, and the facilitation of the social interactions with other humans.⁷ All of these could additionally weigh on the side of benefits of pet ownership. Whether they would be sufficient to outweigh the costs is difficult to foresee.

Assessing the costs of pet ownership is also difficult from present studies, which have generally been aimed at assessing the benefits. I have mainly relied on the obvious financial and time costs of pet ownership to argue that the costs are high. From a Darwinian perspective, we need to know whether this is translated into fewer resources and less care for children or grandchildren and other children, and whether strong attachments to pets actually decrease the numbers of children and grandchildren.

Another limitation of the present argument concerns the variability within pet owners. I have tried to limit this by restricting the discussion to dogs and cats, but of course these two species will present different costs and benefits to their owners (e.g., cats do not have to be walked and generally cost less to feed). There are also

⁷Ruckert (1987) contains a chapter on how to use your pet dog to meet members of the opposite sex.

differences between breeds, particularly in the case of dogs. Many types of dog have a utilitarian as well as a pet function, notably as a burglar deterrent or guard dog. People of different ages and social circumstances will choose to have pets for different reasons, for example, families with young children because they provide companions for the children, young childless couples as child substitutes, and older single people as partner substitutes. Thus, the present argument is likely to apply more in some circumstances than in others. If the benefits are high in some cases, it may be more appropriate to view those cases of pet ownership as a form of mutualism: nevertheless, such pets will still have benefited from their owners' attachment to them, and the present analysis of the mechanisms involved will still apply.

The following question needs to be answered in the future: whether pet keeping is like religion, where fitness costs are outweighed by long-term positive influences on self-esteem and self-confidence; or whether it is like drug-taking, where the long-term fitness costs outweigh any short-term beneficial mood changes, yet once established, its cessation produces negative feelings. These analogies correspond, respectively, to the mutualism and the manipulation views of pet keeping.

IMPLICATIONS

One question raised by the view that pet ownership is a form of social parasitism is why it has persisted as a widespread human characteristic despite its fitness costs. In drawing the analogy with avian brood parasites and inquilinism in insects, I did not mean to imply that the fitness costs were comparable: they are obviously less for owning a pet than for rearing an animal that destroys one's own young. However, even where fitness costs are as high as they are for birds parasitized by the cuckoo, the host birds' nurturing of the cuckoo chick has still persisted. Such situations involve an evolutionary arms race (Dawkins and Krebs 1979), so that we should expect counteradaptations by the host bird. In the case of the cuckoo's hosts, such as the reed warbler, these tend to be concentrated on egg rejection rather than chick discrimination (Davies and Brooke 1988).

The reasons for the lack of chick discrimination by reed warbler parents may include the following (Davies and Brooke 1988; Dawkins and Krebs 1979). First, the comparatively small fitness advantage for the host of discriminating when most of the damage has been done, compared with the enormous fitness advantage gained by the parasite for resisting any discrimination. This would lead to stability of the arms race, because of the *relatively* high cost of evolving effective counter measures. A second likely reason for the lack of chick discrimination is the limited time span available for such measures to evolve. Comparison of different species indicates poorer egg discrimination when exposure to brood parasites is of more recent origin (Davies and Brooke 1988).

Both of these principles, particularly the first one, may apply to the case of pets. The fitness disadvantage to humans of keeping pets (i.e., diverting some resources from the human family) is likely to be relatively low compared to the large advantage for the pet in being protected and fed by human owners. Second, the time span may well have been too short for countermeasures to have evolved, when one

considers, again, the relatively low fitness costs imposed by pet keeping and the relatively recent origin of pet keeping in hominid evolutionary history.

Another consideration relevant to pet keeping (and perhaps also to brood parasitism) is the nature of the mechanisms through which the manipulation of the host occurs. Human reactions to baby features, attributions of mental processes to human-like entities, and the formation of attachments through exposure learning are all general dispositions that would be hard to modify so as to eliminate their operating in relation to animals. Any decrease in such dispositions would produce an individual who was less nurturant generally and, hence, less likely to develop an attachment to his or her own infant. In this respect, pet ownership may be one of several human reactions involving fitness costs because the underlying mechanisms are part of a general disposition whose benefits overall outweigh the costs under some sets of conditions. Other examples include the stress response (Archer 1979), the grief reaction (Archer 1988), and the imprinting-like mechanism that can produce a homosexual orientation (Archer 1996).

The present analysis can also be used to generate a number of novel predictions about pet owners and about people who do not keep pets. For example, people who have chosen to keep pets other than for utilitarian purposes should show a more generally positive reaction to the baby features configuration irrespective of their context (whether involving a child or a pet or a teddy bear); they should also show a greater tendency to attribute mental processes to any entities with human-like behavior. On the other hand, we should expect such dispositions to be lower among those people who did not keep pets and expressed negative views of pet ownership. It may also be the case that these people will show lower levels of nurturance or even more avoidant attachment styles to their own offspring.

If, on the other hand, it were found that those who rejected pet ownership had similar attachment styles to their children as those of pet owners, it would indicate that those in the former group were showing greater discrimination in the application of their parental reactions. They would be the equivalent of a brood parasite host that showed chick discrimination. Such a finding would, however, be counter to the argument set out above.

This sort of research would be founded on different principles from those involved in current research on psychological aspects of pet ownership. This tends to be concerned with commonsense issues and pragmatic questions, such as whether or not pet ownership has immediate benefits. The present evolutionary analysis would enable a more theoretically driven program of research to be generated.

I would like to thank Robin Dunbar for helpful comments on the manuscript and Norman Birbeck for valuable assistance with the literature search. I also thank the editor and two referees for their comments, which stimulated some of the discussion in this paper.

REFERENCES

- Ainsworth, M.D.S. Attachments beyond infancy. *American Psychologist* 44:709–716, 1989.
 Albert, A., and Bulcroft, K. Pets and urban life. *Anthrozoos* 1:9–25, 1987.

- Anderson, W.P. Pet ownership and risk factors for cardiovascular disease. *The Medical Journal of Australia* 157:298–301, 1992.
- Anderson, W.P., Reid, C.M., and Jennings, G.L. Pet ownership and risk factors for cardiovascular disease. Paper presented at the 6th International Conference on Human Animal Interactions, ANIMALS & US, Montreal, 1992.
- Archer, J. *Animals Under Stress*, London: Edward Arnold, 1979.
- Archer, J. The sociobiology of bereavement: A reply to Littlefield and Rushton. *Journal of Personality and Social Psychology* 55:272–278, 1988.
- Archer, J. *Ethology and Human Development*, Hemel Hempstead, UK: Harvester Wheatsheaf, 1992.
- Archer, J. Attitudes to homosexuals: An alternative Darwinian view. *Ethology and Sociology* 17:275–280, 1996.
- Archer, J., Ireland, J., Mills, J., and Parker, S. Human attachment to pet dogs. (n.d.)
- Archer, J., and Winchester, J. Bereavement following death of a pet. *British Journal of Psychology* 85:259–271, 1994.
- Baron-Cohen, S. The theory of mind hypothesis of autism: History and prospects of the idea. *The Psychologist: Bulletin of the British Psychological Society* 5:9–12, 1992.
- Bergler, R. The contribution of dogs to avoiding and overcoming everyday stress factors. Paper presented at the 6th International Conference on Human Animal Interactions, ANIMALS & US, Montreal, 1992.
- Bergler, R., and Loewy, D. Singles and their cats. Paper presented at the 6th International Conference on Human Animal Interactions, ANIMALS & US, Montreal, 1992.
- Berman, W.H., and Sperling, M.B. The structure and function of adult attachment. In *Attachment in Adults: Clinical and Developmental Perspectives*, M.B. Sperling and W.H. Berman (Eds.). New York and London: Guilford Press, 1994, pp. 3–28.
- Berryman, J.C., Howells, K., and Lloyd-Evans, M. Pet owner attitudes to pets and people: A psychological study. *The Veterinary Record* 117:659–661, 1985.
- Bombar, M.L., and Littig, L.W. Babytalk as a communication of intimate attachment: An initial study in adult romances and friendships. *Personal Relationships* 3:137–158, 1996.
- Bowlby, J. *Attachment and Loss, Volume 1. Attachment*, London: The Hogarth Press and Institute of Psychoanalysis, 1969 (Penguin edition, 1971).
- Bowlby, J. *Attachment and Loss, Volume 2. Separation: Anxiety and Anger*, London: The Hogarth Press and Institute of Psychoanalysis, 1973 (Penguin edition, 1975).
- Cameron, P., and Mattson, M. Psychological correlates of pet ownership. *Psychological Reports* 30:286, 1972.
- Carmack, J. The effects on family members and functioning after death of a pet. *Marriage and Family Reviews* 8:149–161, 1985.
- Churcher, P.B., and Lawton, J.H. Predation by domestic cats in an English village. *Journal of Zoology (London)* 212:439–455, 1987.
- Clutton-Brock, J. Man-made dogs. *Science* 197:1340–1342.
- Davies, N.B., and Brooke, M. Cuckoos versus reed warblers: Adaptations and counteradaptations. *Animal Behaviour* 36:262–284, 1988.
- Davis, S.J.M., and Valla, F.R. Evidence for domestication of the dog 12,000 years ago in the Natufian of Israel. *Nature* 276:608–610, 1978.
- Dawkins, R., and Krebs, J.R. Arms races between and within species. *Proceedings of the Royal Society of London B* 205:489–511, 1979.
- Diamond, J. *The Rise and Fall of the Third Chimpanzee*, London: Radius Books, 1991.
- Drake-Hurst, E. The grieving process and the loss of a beloved pet: A study of clinical relevance. *Dissertation Abstracts International* 51:5025–B, 1991.
- Dunn, K.L., Katcher, A.H., and Greenberg, H. The form and duration of the grief following the death of a pet: Influence of a social support. Paper presented at the 6th International Conference on Human Animal Interactions, ANIMALS & US, Montreal, 1992.
- Endenburg, N. The attachment of people to companion animals. *Anthrozoos* 8:83–89, 1995.
- Freedland, J. Pets best interests are a dog's breakfast for divorce judges. *The Guardian* 23 August, p. 9, 1994.
- Friedmann, E. The role of pets in enhancing human well-being: Physiological effects. In *The Waltham Book of Human Animal Interaction: Benefits and Responsibilities of Pet Ownership*, I. Robinson (Ed.). Oxford and New York: Pergamon, 1995, pp. 33–53.
- Friedman, E., Katcher, A.H., Lynch, J.J., and Thomas S.A. Animal companions and one-year survival of patients after discharge from a coronary care unit. *Public Health Reports* 95:307–312, 1980.
- Friedman, E., Katcher, A.H., Thomas, S.A., Lynch, J.J., and Messent, P.R. Social interaction and blood

- pressure: Influence of companion animals. *The Journal of Nervous and Mental Disease* 171:461–465, 1983.
- Gage, M.G., and Holcomb, R. Couple's perception of stressfulness of death of the family pet. *Family Relations* 40:103–105, 1991.
- Gerwolls, M.K., and Labott, S.M. Adjustment to the death of a companion animal. *Anthrozoos* 7:172–187, 1994.
- Goldberg, D., and Williams, P. *A User's Guide to the General Health Questionnaire*, Windsor (U.K.): NFER-Nelson, 1978.
- Gosse, G.H. Factors associated with the human grief experience as a result of the death of a pet. *Dissertation Abstracts International* 49:50011–B, 1989.
- Gosse, G.H. and Barnes, M.J. Human grief resulting from death of a pet. *Anthrozoos* 7:103–112, 1994.
- Gould, S.J. *The Panda's Thumb*, New York: W.W. Norton, 1980 (1983 edition published by Penguin, Harmondsworth).
- Graves, D. Helpline for grieving pet owners. *The Daily Telegraph* 9 April, p. 7, 1994.
- Haddon, C. Pets: Thanks for the memory. *The Daily Telegraph: The Weekend Telegraph* 28 May, p. 4, 1994.
- Hazan C., and Shaver, P. Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology* 52:511–524, 1987.
- Hickrod, L.J.H., and Schmitt, R.L. A naturalistic study of interaction and frame: The pet as "family member." *Urban Life* 11:55–77, 1982.
- Hinde, R.A. *Ethology*. Oxford: Oxford University Press, 1982.
- Hinde, R.A., and Barden, L.A. The evolution of the teddy bear. *Animal Behaviour* 33:1371–1373, 1985.
- Hirsh-Pasek, K., and Treiman, R. Doggerel: Motherese in a new context. *Journal of Child Language* 9:229–237, 1982.
- Hyde, K.R., Kurdek, L., and Larson, P. Relationship between pet ownership and self-esteem, social sensitivity and interpersonal trust. *Psychological Reports* 52:110, 1983.
- Joubert, C.E. Pet ownership, social interest and sociability. *Psychological Reports* 61:401–402, 1987.
- Katcher, A.H., Friedmann, E. Goodman, M., and Goodman, L. Men, women, and dogs. *Californian Veterinarian* 2:14–16, 1983.
- Keddie, K.M.G. Pathological mourning after the death of a domestic pet. *British Journal of Psychiatry* 131:21–25, 1977.
- Keillor, G. *We are Still Married*. New York: Viking Penguin, 1989.
- Kidd, A.H., and Feldman, B.M. Pet ownership and self-perceptions of older people. *Psychological Reports* 48:867–875, 1981.
- Krebs, J.R. and Dawkins, R. Animal signals: Mind reading and manipulation. In *Behavioural Ecology: An Evolutionary Approach*, J.R. Krebs and N.B. Davies (Eds.). Oxford: Blackwell, 1984, pp. 380–402.
- Lago, D., Kafer, R., Delaney, M., and Connell, C. Assessment of favorable attitudes toward pets: Development and preliminary validation of self-report pet relationship scales. *Anthrozoos* 1:240–254, 1988.
- Laungani, P. Patterns of bereavement in Indian and English society. Paper presented at the Fourth International Conference on Grief and Bereavement in Contemporary Society, Stockholm, June 12–16, 1994.
- Levinson, B.M. The dog as a "co-therapist." *Mental Hygiene* 46:59–65, 1962.
- Lombardo, W.K., Cretser, G.A., Lombardo, B., and Mathis, S.L. Fer cryin' out loud—There is a sex difference. *Sex Roles* 9:987–995, 1983.
- Lorenz, K. Die angeborenen Formen möglicher Erfahrung. *Zeitschrift für Tierpsychologie* 5:235–409, 1943.
- Lorenz, K. *Studies in Animal and Human Behaviour, Volume I* (R. Martin, Trans.). London: Methuen, 1970.
- Lorenz, K. *Studies in Animal and Human Behaviour, Volume II*, (R. Martin, Trans.). London: Methuen, 1971.
- Lysons, A. On grooming—physiological effects of interacting with pets. Paper presented at the 6th International Conference on Human Animal Interactions, ANIMALS & US, Montreal, 1992.
- Messent, P.R., and Serpell, J.A. An historical and biological view of the pet-owner bond. In *Interrelations Between People and Pets*, B. Fogle (Ed.). Springfield, IL: Charles C. Thomas, 1981, pp. 5–22.
- Musil, R. Domestication of the dog already in the Magdalenian. *Anthropologie* 8:87–88, 1970.
- O'Farrell, V. *Dog's Best Friend: How Not to be a Problem Owner*. London: Methuen, 1994.
- Paden-Levy, D. Relationship of extroversion, alienation, and divorce incidence with pet ownership. *Psychological Reports* 57:868–870, 1985.
- Parkes, C.M. *Bereavement: Studies of Grief in Adult Life*, 2nd ed. London and New York: Tavistock, 1986 (Penguin edition, 1986).

- Quackenbush, J.E. Pet bereavement in older owners. In *The Pet Connection: Its Influence on Our Health and Quality of Life*, B.K. Anderson, B.L. Hart, and L.A. Hart (Eds.). Minneapolis: University of Minnesota Press, 1984, pp. 292–299.
- Quackenbush, J.E. The death of a pet: How it can affect owners. *Veterinary Clinics of North America: Small Animal Practice* 15:395–402, 1985.
- Rajaram, S.S., Gararity, T.F., Stallones, L., and Marx, M.B. Bereavement-loss of a pet and loss of a human. *Anthrozoos* 6:8–16, 1993.
- Ruckert, D. *The Four-Footed Therapist*, Berkeley, CA: Ten Speed Press, 1987.
- Rynearson, E.K. Humans and pets and attachment. *British Journal of Psychiatry* 133:550–555, 1978.
- Sanders, C.M., Mauger, P.A., and Strong, P.N. *A Manual for the Grief Experience Inventory*. Palo Alto, CA: Consulting Psychologist Press, 1985.
- Savishinsky, J. Pet ideas: The domestication of animals, human behavior, and human emotions. In *New Perspectives on Our Lives with Companion Animals*, A.H. Katcher and A.M. Beck (Eds.). Philadelphia: University of Pennsylvania Press, 1983, pp. 112–131.
- Serpell, J.A. The personality of the dog and its influence on the pet-owner bond. In *New Perspectives on Our Lives with Companion Animals*, A.H. Katcher and A.M. Beck (Eds.). Philadelphia: University of Pennsylvania Press, 1983, pp. 57–65.
- Serpell, J.A. *In the Company of Animals*, Oxford: Blackwell, 1986.
- Serpell, J.A. Pet keepings in non-western societies. *Anthrozoos* 1:166–174, 1987.
- Serpell, J.A. Beneficial effects of pet ownership on some aspects of human health and behaviour. *Journal of the Royal Society of Medicine* 84:717–720, 1991.
- Serpell, J.A. Evidence for an association between pet behaviour and owner attachment levels. *Applied Animal Behaviour Science* 47:49–60, 1996.
- Siegel, J.M. Pets and the physician utilization behavior of the elderly. Paper presented at the 6th International Conference on Human Animal Interactions, ANIMALS & US, Montreal, 1992.
- Smith, S.L. Interactions between pet dog and family members: An ethological study. In *New Perspectives on Our Lives with Companion Animals*, A.H. Katcher and A.M. Beck (Eds.). Philadelphia: University of Pennsylvania Press, 1983, pp. 29–36.
- Stewart, C.S., Thrush, J.C., and Paulus, G. Disenfranchised bereavement and loss of a companion animal: Implications for caring communities. In *Disenfranchised Grief: Recognizing Hidden Sorrow*, K. Doka (Ed.). Lexington, MA: Lexington Books (D.C. Heath & Co.), 1989, pp. 147–159.
- Stewart, M. Loss of a pet—loss of a person: A comparative study of bereavement. In *New Perspectives on Our Lives with Companion Animals*, A.H. Katcher and A.M. Beck (Eds.). Philadelphia: University of Pennsylvania Press, 1983, pp. 390–404.
- Triandis, H.C. *Individualism and Collectivism*, Boulder, CO: Westview Press, 1995.
- Vormbrock, J.K. Attachment theory as applied to wartime and job-related marital separation. *Psychological Bulletin* 114:122–144, 1993.
- Weiss, R.S. Loss and recovery. *Journal of Social Issues* 44:37–52, 1988.
- Wheeler, W.M. *Social Life Among the Insects*, London: Constable, 1923.
- Wickler, W. *Mimicry*. London: Weidenfeld & Nicholson, 1968.
- Willaims, D.G., and Morris, G.H. Self reports of crying behaviour by British and Israeli adults. *British Journal of Psychology* 87:479–505, 1996.
- Wilson, E.O. *Sociobiology: The New Synthesis*. Cambridge, MA: Harvard University Press, 1975.
- Zasloff, R.L., and Kidd, A.H. Loneliness and pet ownership among single women. *Psychological Reports* 75:747–752, 1994.