The Chautauqua Journal

Volume 1 *Nature's Humans* Article 5

2016

Lessons from Animal Sentience: Towards a New Humanity

Jonathan Balcombe

JONATHAN BALCOMBE

LESSONS FROM ANIMAL SENTIENCE: TOWARDS A NEW HUMANITY

Introduction – Moral Progress, and a Paradox

Many years before I became a professional biologist, as a boy of about 9, I used to explore the wet ditches on each side of the railroad tracks that bordered the lakes and bays at the summer camp I went to north of Toronto, Canada. I was drawn to the many frogs and dragonflies there, and if it was a particularly good day I'd find a garter snake. One day, a scruffy-looking man ambled along the tracks. In one hand he held a heavy cloth sack and a dipping net on the end of a pole. In the other he held a leopard frog. He asked me to hold the frog. I took the frog while he waded into the ditch to catch another one. I didn't know why he was catching frogs, but I didn't like their prospects. I was a compliant kid and it was against my nature to disobey a grown-up. But as I stood there looking at that frog, I saw things from the frog's perspective. A strong urge came over me to release that frog. So I did. The man returned. He was angry, and I learned some new swear words that day. My ears burned from the scolding. But I believed then, as I do now, that I did the right thing in letting that frog go.

The frogs in the man's sack may have been intended for fishing bait. Or perhaps they would end up in biology classrooms, where every year millions of impressionable youngsters are given a dead frog to dissect so they will see a frog's intestines and how the tongue extends, as well as feel the slickness of a gastrocnemius muscle. Those students also tacitly learn the oldest lesson in the book when it comes to our relationship to the animals: *they were put here for us, and we can do with them as we please.* This is what we may call the doctrine of *might-makes-right.* Might-makes-right is the rule of the bully in the children's sandbox who says: *I am the rightful owner of that toy dumptruck because I am bigger and smarter than you.* Might-makes-right takes what it can get. It doesn't pause to ask: *Hmmm, maybe that little fella has feelings, too.*

Humans have a rich legacy of *might-makes-right* thinking. Colonialism, slavery, the subjugation of women, and the denial of civil rights to African Americans are among

its more notable manifestations. One of the plainest moral objections to the might-makes-right way of thinking as a basis for treating others is that it is vulnerable to the intelligent alien scenario. If might-makes-right were valid, then we must concede that there would be nothing immoral about a "superior" race of aliens arriving to enslave, kill, and eat us.

Happily, humankind has made significant progress in relegating those wrongs to the history books. But today, there remains an enormous domain in which might-makes-right thinking continues to hold sway, and that is in our relationship to the other animals. Since the time humans developed the capacity to control animals, we have done so. Today, we kill over 100 million for recreational hunting and fishing, a similar number to satisfy our scientific curiosity, some 50 million for their fur, and tens of millions of cats and dogs because there are not enough homes for them. And of course, we kill enormous numbers of animals so that we may put them into our mouths. According to the Food and Agriculture Organization, humans kill somewhere in excess of fifty billion land animals yearly to eat them (FAO 2006), and it's a fair estimate that we kill a comparable number of fish. Paradoxically, while our knowledge and understanding of animals and their mental and emotional capacities are unprecedented, so is our exploitation of them. In 2010 humans will have killed more animals than in any other year in our history. There are two reasons for this: 1) globally, meat consumption by humans is rising, and 2) there are more mouths to feed due to a climbing human population.

So why do animals matter? The singular reason is that they are sentient. Animals, like us, have the capacity to feel pains and pleasures and to suffer. We may quibble about where we draw the line on sentience, and we may struggle to imagine what it is like to be a bat or a minnow; but there remains no reasonable scientific doubt that all members of the vertebrate subphylum, as a minimum, are equipped to experience good and bad feelings.

Intellicentrism

My aim in this essay, and in much of my writings on animals, is to make accessible emerging information about animal sentience that contradicts common assumptions about them. Perhaps the most destructive assumption of all stems from our *intellicentrism*—a

term I use to describe our focus on intelligence as the most important yardstick of an individual's worth. In his 1981 book, *The Mismeasure of Man*, American biologist Stephen Jay Gould documents the misuse of science by white Europeans to suggest that they had larger brains and were more intelligent than other races. This was used to justify the African slave trade and other human injustices. Another manifestation of intellicentrism is the flimsy notion that greater intelligence equates to greater sentience. There is no solid science to back up this claim, and it is a fairly intuitive idea that intelligence need not align smoothly with a capacity to feel pains and pleasures. It is also not a new idea. In the 18th Century, the British cleric and moral thinker Humphrey Primatt (1735-1779) said: "Superiority of rank or station exempts no creature from the sensibility of pain, nor does inferiority render the feelings thereof the less exquisite" (Primatt 1776). More recently, the contemporary British biologist John Webster put it bluntly: "People have assumed intelligence is linked to the ability to suffer, and that because animals have smaller brains they suffer less than humans. That is a pathetic piece of logic" (Webster 2006).

Showcasing Animal Sentience

Let me proceed to give just some of many examples of animal capacities that may surprise some readers. Most of these discoveries about intelligence, emotionality, awareness, communication, pleasure, and virtue are recent; and the reason for this is primarily that questions about animals' minds, feelings, and experiences were deemed taboo by prevailing scientific opinion during the first three-quarters of the 20th Century; it is only in the past 40 years or so that scientists have begun to delve seriously into these matters.

Intelligence

At the risk of subverting my earlier point on intellicentrism, let me start with a few examples of animals' cognitive abilities. The intent here is not to suggest they are as smart as we are (though in some realms, as you will see, they can be smarter), but rather

to emphasize that they too have minds, they think, and they use their intelligence to solve problems.

Perhaps the most striking example yet discovered about animal intelligence comes from our closest relative, the common chimpanzee. A group of captive chimps living in a stimulating indoor/outdoor facility in Japan was presented with a variety of puzzles to examine their cognitive skills. Among these puzzles is a game in which the numerals 1 to 9 flash briefly as a random array on a computer screen before being individually concealed by white rectangles. The chimpanzee's task is to point to each rectangle in the order of the numbers they replaced. If s/he gets all nine correct then a treat is dispensed beneath the screen, while a wrong answer yields no treat, with the result that the chimp is motivated to solve the puzzle correctly. If the numbers appear for just one second before being covered by rectangles, a young chimp will correctly solve the task virtually 100 percent of the time (Inoue & Matsuzawa 2007). Humans don't do nearly as well; we struggle to recall the first three or four numbers in succession. Chimps solve the task about 90 percent of the time if they are given just one-fifth of a second. When the British memory champion Ben Pridmore—who can remember the order of a shuffled deck of cards in 30 seconds—competed head-to-head against Ayumu, one of the more proficient of the young chimps, the chimp performed three times better (McRae 2008). The power of this example is that it illustrates a form of raw intelligence in which a non-human clearly outsmarts the human.

We tend to take a prejudiced view of animal intelligence. Chimpanzees were thought to have poor face recognition skills until someone decided to test them with chimpanzee faces instead of human faces, which we just assumed were more distinctive. Lo and behold, chimps have equivalent face recognition abilities when tested on their own kind (Parr & De Waal 1999). They also exceed us in recognizing upside-down faces, which likely relates to their penchant to playfully hang from branches. Another of our prejudices is toward animals we plan to eat. Perhaps it makes us feel less guilty about killing them if we believe that they are dim. But "farmed animals" have been studied quite extensively, and they show keen awareness and intelligence. Sheep, for instance, can remember the faces of fifty of their original flock-mates from photographs presented to them two years after they were moved to another flock (Kendrick et al. 2001). Sheep

also distinguish the face of a stressed (hungry) and a contented (satiated) sheep, preferring the latter (BBC 2004). Pigs are excellent problem-solvers (Broom et al. 2009); cattle have keen individual recognition skills (CIWF 2003); and chickens have a vocabulary of more than 30 calls (Collias 1987), including at least one that is sometimes used deceptively to manipulate others (Gyger & Marler 1988). The old tale that turkeys drown in the rain is a myth, and I have two words for anyone who thinks a tom turkey must be stupid for mounting and trying to mate with a stuffed model of a hen turkey: inflatable doll.

Emotionality

Charles Darwin provided a good introduction to animal emotions in his 1872 book, *The Expression of the Emotions in Man and Animals*, but another century passed before science took renewed interest in this topic. Anyone who has lived with dogs or cats probably doesn't need convincing that they are emotional, and their emotions may be more profoundly expressed than our own. Following a visit to the vet, one of my two cats, Mica, was so traumatized that he went on a hunger strike and wouldn't come downstairs for 40 hours. And he was not even the one who had gone! It was his sister, Megan. There are, of course, countless anecdotes of intense emotionality in our companion animals.

Scientific studies are revealing emotional capacities in animals that few would have believed a generation ago. A long term study of baboons in Botswana has shown, among many other findings, that females who lose an infant exhibit physiological and behavioral responses that mirror those of women who suffer the same loss (Engh et al. 2006). Glucocorticoid hormones—associated with grief—rise for a month or more in both species. Baboon mothers bereaving the loss of a child expand their social networks by spending more time grooming and receiving grooming among their friends. It is viewed by the researchers who have been observing these baboon communities for decades as a form of therapy that aids recovery from the emotional trauma of a mother's loss. It is a baboon's version of the social support we show to a grieving friend or relative.

In a study from Newcastle University in England, wild-caught European starlings were initially housed individually in basic cages with dowel perches and water bottles with food available except during the experimental sessions (Bateson & Matheson 2007). The birds were trained to forage by plucking the lids from dishes in which a mealworm had been placed and quickly learned that dishes with white lids contained tasty worms, whereas dishes with dark gray lids harbored unpalatable (quinine-flavored) worms. All soon ceased bothering to flip dark gray lids. Then some starlings were transferred to enriched aviaries with other birds, room to fly, branches, and water baths while the rest were moved to different basic cages identical to the ones in which they were initially housed. When the experimenters began presenting the starlings with ambiguous dishes—lids with lighter shades of gray—they found that only the enriched environment birds were likely to flip over these lids and sample the worm inside. When the enriched birds were placed in basic cages, they showed the most pessimistic response of all, while those who now enjoyed the enriched cages became more optimistic. The suggestion that confined birds become pessimistic reflects the common behavior of depressed humans who are much less likely to take a chance on an uncertain outcome.

Studies like those of baboons and starlings described above undermine a common assumption we make about animals: that they live only in the moment. Bereavement and pessimism/optimism are not fleeting emotions. They are long-term feelings of an individual who experiences life not as a series of snapshots but as a constantly unraveling tapestry of experiences.

Awareness

Awareness is another manifestation that an animal experiences life and is not merely alive. We know from watching them that animals take an interest in their surroundings and respond flexibly to changing situations. Studies show that rats have metacognition—that is, they know what they know and they are aware of being uncertain about something. In a game in which a correct answer yields a sizable food treat and an incorrect response yields nothing, rats will confidently choose the correct answer in a simple binary task, such as identifying the longer of two tones played in succession. But

if the two tones are of very similar duration, the rat is more likely to choose a default option—poking her nose into a cone to indicate that she isn't sure and would prefer to settle for a very small treat instead. This clever experimental set-up illustrates that metacognition extends to non-primates (Foote & Crystal 2007).

Studies of elephants illustrate another form of awareness: keeping mental tabs on the whereabouts of others. In one investigation, individual samples of female elephant urine mixed with earth were placed in the paths of 36 different elephant families and the reactions of the passing elephants observed. Elephants showed little interest if the urine sample was from an elephant outside their group, but stopped to reach with their trunk if the sample was from a family member. The response was noticeably heightened if the fresh urine was from a family member who was walking further behind. Urine from a family member who was far away and not in the herd also elicited a heightened response. The researchers described the elephants' reaction as one of "surprise" because it doesn't fit expectation to find fresh urine deposited by an individual who you know is walking behind you. Based on these observations, the team estimates that African elephants are able to keep tabs on at least 17 females and as many as 30 individuals of both sexes, at any given time (Bates et al. 2008).

A particularly advanced form of awareness is self-awareness. Until recently, only great apes, elephants and dolphins had passed the so-called "mirror-self-recognition test," in which an animal is presented with a mirror after a mark has been surreptitiously placed on its body such that it is only visible in the reflection. This test is considered a particularly stringent evaluation of self-awareness (i.e., passing the test is strong evidence of self-recognition, whereas failing it might not necessarily mean an absence of this form of awareness). In August 2008, a team of German researchers demonstrated mirror-self-recognition in a bird species. They secretly placed a colored adhesive dot on the throats of several magpies. On seeing their reflection in a mirror, some birds tried to remove the dot by scratching at it with their feet; others tried to pull it off with their beak. Black dots, which were camouflaged against the magpies' black neck feathers, were ignored. The magpie study is an important advance in what we know of the evolution of self-awareness because it shows this capacity has evolved separately in at least two separate lineages: the brains of birds and the brains of mammals. Lacking a neocortex—that

prominent, often convoluted part of the mammalian brain—birds' brains have instead undergone evolutionary development of the paleocortex. The previous meaning of "birdbrain" is being invalidated by scientists and replaced with a new definition to reflect their independently evolved mental capacities that rival those of mammals (Jarvis et al. 2005).

Communication

How animals communicate is another window into their inner lives. Northern Arizona University biology professor Con Slobodchikoff has studied prairie dogs for over 30 years, and befitting their social nature, he has found that prairie dogs have a sophisticated system of predator alerts. Their alarm calls convey specific information about an approaching foe including species, size, shape, color, and—I am not making this up—whether or not a gun has been carried. When hawks come into view, prairie dogs run to their burrow entrances and dive inside. If the enemy is a coyote, they remain above-ground, watching vigilantly from a burrow entrance; or if a dog, they may just stand erect where they are foraging. If presented with only recordings of an alarm call in the absence of any actual predator, the rodents respond in kind, demonstrating that they understand the meanings of these different calls. The alarm calls of prairie dogs vary somewhat with geographic locale, thereby demonstrating local dialects. For the man with gun alert, one member of the research team was visible to the prairie dogs. The animals sounded the alert for "man." Then between one and five minutes later, he fired a shotgun into the ground near the colony. This happened daily for five days. After a two day no-show, his reappearance without gun, elicited a distinctive call unlike that for his first appearance prior to the gun firings; instead of remaining alert outside the burrow, the animals changed their behavior by promptly disappearing into their burrows (Frederiksen & Slobodchikoff 1991).

Dolphins have signature whistles which function as individual identifiers similar to our names. Not only do dolphins utter their own whistles, they also utter the whistles of other individuals as a way of getting their attention. Wild bottlenose dolphins continue to respond appropriately to synthesized versions of their verbal signatures that have lost

their distinctive vocal character. Thus, they are cueing in on the phrase itself. Just as you recognize your name no matter who utters it, so do they. The research team concluded that dolphins are the only animals other than humans known (thus far) to transmit identity information independent of the caller's voice or location (Janik et al. 2006).

Or are they? Within a year of the publication of the dolphin paper, Spectacled Parrotlets were also reported to label family members by referring to them with different calls. Analyses showed high fidelity and reproducibility in calls made between pairs of individuals relative to other individuals, and birds were more responsive to recorded calls that had been uttered in their presence (i.e., presumably referencing the listener with his/her own "name") than to calls uttered in the presence of another family member (Wanker et al. 2005).

Pleasure

Possessing minds and emotions implies the capacity to like some things and to dislike others. Pain is not a controversial feeling in animals, and there are at least two dozen scholarly journals dedicated to the study of pain in humans and other animals. Oddly enough, however, science has taken very little interest in the study of pain's opposite: pleasure. There are no journals dedicated to the meaning and significance of good feelings in humans or other animals. Yet, as I explain in two books—*Pleasurable Kingdom: Animals and the Nature of Feeling Good* (Balcombe 2006) and *The Exultant Ark: A Pictorial Tour of Animal Pleasure* (Balcombe 2011)—pleasure plays as vital a role in animals' lives as it does in ours. In a carrot-and-stick world, pleasure is nature's carrot. It teaches sentient organisms what is good, and motivates them to pursue things (e.g., food, shelter, play, sex) that promote survival and procreation. We may view play as a frivolous activity, but it is an important survival tool, since it provides—especially for younger individuals—practice for important adult behaviors. Games of chase and wrestling are as important for prey as they are for predators, whose survival requires the ability to flee and escape, and to catch and subdue, respectively. Play also teaches key social behaviors, such as the ability to restrain oneself (one who plays too rough will soon have no playmate) and to read the intentions and the emotional tenor of another, as well

as other communication skills. But playing animals aren't thinking about Darwinian fitness or the survival imperative. Play is intrinsically rewarding, and they (like us) play because it is fun.

Fruit provides an excellent illustration of the pleasure built into animals' lives. Technically, fruit evolved as a means to move a plant's seeds away from the parent plant where they would otherwise have to compete for light, water and nutrients. Plants have evolved different ways to solve this evolutionary conundrum, including seeds that blow in the wind and others that stick to animals' fur or feathers (or our clothing) and that get re-deposited elsewhere when the host grooms, preens or plucks the offending hitchhiker off. Fruit, like burrs, coevolved with mobile organisms (animals) which act as seed transporters. In this instance, the relationship is mediated by rewards: bright colors, sweet smells, delicious tastes, and a big nutritional reward. The animal either carries the fruit away, or eats it on site, later depositing the seeds in a convenient package of fertilizer. In *The Botany of Desire*, author Michael Pollan (2001) describes the relationship between fruit and frugivores as a grand coevolutionary bargain struck between plants and animals.

Other sources of pleasure for animals include sex, touch, and possibly aesthetics. Animal sex is not always as perfunctory and passionless as it appears in textbooks and nature documentaries. Animals are, predictably, highly motivated to engage in sex when the time is right, but is that the only time? Seattle-based biologist Bruce Bagemihl (1999) set out to document non-procreative sex in animals and ended up with a 750 page book, titled *Biological Exuberance*, which describes countless examples of sexual behavior that is manifestly not going to result in the production of offspring: same-sex pairings, mating out of season, auto-erotica, and non-reproductive forms of penetrative behavior. Female orgasms are well-documented in many primate species, and bonobos (formerly called pygmy chimpanzees) use sex as a social lubricant, engaging in a wide array of sexual behaviors as a regular part of their daily activities.

We know that the touch of another can be relaxing, stimulating, and intensely pleasurable. Other animals use touch in a similar way. In some monkey societies, members spend a fifth of their waking time grooming each other. Grooming, like massage, releases endorphins into the bloodstream, which has a calming effect especially

on the recipient. The pleasure of touch appears to be at the root of cleaner-client relationships among reef fishes. Some species, like the cleaner wrasse, make a living by performing a cleaning service for other fishes, who actually line up to await their turn. The cleaner gets a meal by removing algae, parasites, and other material from the client's body. Clients cooperate fully, opening their mouths and their gill slits so that their business partner may gain access to these areas. And as a partnership built on trust between cooperating individuals who recognize and remember each other, clients don't eat their cleaners, even though they easily could. Occasionally, cleaners will overstep their bounds and take a nip from a client's fin. This may result in a chase or the end of the relationship. Other fishes monitor cleaner-client interactions and keep tabs on their performance, forming "image scores" upon which they base their selection of cleaners to service them. So complex are these associations that the term "Machiavellian intelligence" has been applied to them by one ethologist who studies them (Bshary 2006). Similar cooperative interactions have been observed between hippopotamuses, who spread their legs, splay their toes and open their huge mouths so that fishes of different species may perform their cleaning services. In Uganda, wild warthogs will flop down on their sides and lie blissfully still while a family of banded mongooses plucks over their skin. The cleaners get some nourishment and the host receives a spa service.

Can animals derive aesthetic pleasure? It's an interesting question that I hope scientists will address. Certainly, flowers and fruit were looking and smelling attractive long before humans walked the earth, and birds and fishes were sporting bright colors. It doesn't necessarily follow that the beholder appreciates their beauty, per se, but these characteristics evolved as attractants, "designed" to grab attention. To the extent that a ripe fruit signals an impending reward, its recognition by an animal who plans to eat it is at least accompanied by pleasurable feelings, so a positive association should be established. There are anecdotal accounts of chimpanzees gazing at sunsets and dancing around waterfalls. Perhaps these are elements of what we manifest as artistic appreciation.

Virtue

Virtue is an exciting frontier in the study of animals. Traditionally, virtue has been considered only the province of human beings. But it is now recognized that beneficence is widespread in animals. Social living demands it. An individual who is mean, unfair, greedy, and/or violent risks being shunned by the group and losing some of the attendant benefits of social living, such as collective vigilance against danger, information sharing, and partners for play, grooming, and mating. The ethologist Marc Bekoff is a pioneer in the study of animal virtue, and his book *Wild Justice: The Moral Lives of Animals*, co-authored with Jessica Pierce, is a rich compendium of examples of animals behaving beneficently, and why we should expect them to (Bekoff & Pierce 2009).

Despite our penchant for glamorizing predator-prey interactions and our tendency to focus on competition to the neglect of cooperation, most relationships in nature are positive, not negative. If you doubt this, go look in the mirror. There you will behold a hive of cooperation. Most of the cells you carry around with you each day are not you. They are bacteria and they are friends, not foes. These symbionts have dwelt within us for millennia. One of their chief benefits is in helping us to break down our food. Even those cells that contain our DNA are not entirely us. The mitochondria they contain—ubiquitous organelles that generate energy—contain their own DNA. According to the now widely accepted Endosymbiotic Theory, first proposed (and initially rejected) by American biologist Lynn Margulis, mitochondria possibly originated as parasites that insinuated themselves into animal cells and eventually became vital allies.

One theory for the origin of virtuous behavior is that it may have arisen from play. Play can be boisterous and may even cause injury, but it is intended to be mutually fun and beneficial. Effectively play involves care and restraint among the participants. Animals have clear signals that they intend to play. Careful video analysis of playing dogs and rats, for example, shows that they calibrate the intensity of their play to sustain the play mood (Pellis 2002). A larger participant, for instance, will allow a smaller and weaker partner to pin it down. In short, play has rules of engagement, which hints at the origins of right and wrong. Intriguing new studies show a monkey will share food with another who helped secure it from beyond their reach—passing morsels between the

wires separating their cages. Other studies show that two monkeys will happily accept slices of cucumber from a human researcher, but when one monkey begins to receive preferred grapes, the other no longer is content with cucumbers; s/he hands them back or tosses them aside and then holds out a hand for a grape (Brosnan & De Waal 2003). Similarly, two dogs will offer a paw to shake hands with a human thirty or more times in succession; but if only one of the dogs is receiving a treat each time she does a paw-shake, the other will only go about ten or twelve rounds before looking away and refusing to offer her paw (Range et al. 2009). These studies suggest an awareness of fairness. Such an interpretation may be debatable; but at the least, these animals object to unequal treatment for the same behavior.

Animal Nature and Human Nature, Resolving the Paradox

How should our new-found understanding of animal intelligence, emotionality, awareness, communication, pleasure, and virtue inform our evolving relationship to animals? Because they are sentient, autonomous individuals with feelings, experiences, and minds of their own, their lives have moral traction. Because they can feel pleasure, their lives have intrinsic value; that is, value to themselves regardless of any commercial or other utilitarian value we may place on them. But the current paradigm of our relationship to them is not informed by our modern understanding of animals' capacities. We continue to place them squarely outside the circle of our moral consideration. Currently, animals' legal place in human society is as the property of humans. Animals may be purchased, traded, enslaved, and killed for profit or pleasure. Depending on the arbitrary conventions of different societies or different elements of the same society, a cat may be a pet, a pest, or dinner.

Our humanity—that is, our moral awareness and capacity to do good—demands that this relationship change. It is imperative that it happen because the very values we hold as proper and civilized in our treatment of our fellow human beings are violated in the way we treat sentient animals. Sentience is the bedrock of ethics. The reason it is wrong to deliberately and maliciously cause another pain and suffering is because pain and suffering are fundamentally bad. As autonomous individuals who can feel pains and

pleasures, our fellow humans and the kinds of animals described in the previous section have a basic right to avoid gratuitous suffering and to pursue pleasure. One of the noblest traits of our human nature is our ability to recognize injustices and to correct them. We have shown this in our capability and our will to address the abhorrent practices of racism, colonialism, and sexism. The next step in our moral evolution is to address speciesism—the arbitrary and capricious discrimination against individuals based on species membership. Doing so is in our best interests as well as theirs. Violence is indivisible. When we commit violence towards animals, we are, in effect, committing violence against ourselves. Treating other sentient beings cruelly and with indifference impoverishes us and makes us callous toward the suffering of others, humans included. Similarly, kindness and compassion are not material things for which we have a limited capacity. One doesn't use up compassion and have no room for more. On the contrary, compassion and kindness are synergistic, self-reinforcing concepts. A world in which we treat all sentient beings with concern and respect will be a better world for everyone.

It is time to repudiate the bully in the children's sandbox. As American writer and naturalist Henry Beston said, "[Animals] are not brethren, they are not underlings: they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendor and travail of the earth" (Beston 1928). The New Frontier isn't outer space; it is learning to coexist peacefully with other sentient beings.

The most profound, immediate step anyone can take for animals is to stop eating them. Period. Adopting a plant-based diet is the ultimate personal activism on behalf of animals. We achieve little for animals when we pontificate about their welfare between bites of a cheeseburger. If you purchase meat, fish, and/or dairy products, find out where they come from, learn what you are funding with your purchases, and make an informed decision based on conscience. Few of us would countenance what goes on these days in factory farms, slaughterhouses, and in the commercial fishing industry. A shift in human eating habits away from animal sources of protein and toward plant sources is at the heart of the change that must occur in the human-animal relationship. I urge you to take this step.

Works Cited

Bagemihl, B. 1999. *Biological Exuberance: Animal Homosexuality and Natural Diversity*. London: Profile Books.

Balcombe, J.P. 2006. *Pleasurable Kingdom: Animals and the Nature of Feeling Good*. New York: Palgrave Macmillan.

Balcombe, J.P. 2011. *The Exultant Ark: A Pictorial Tour of Animal Pleasure*. Berkeley, California: University of California Press.

Bates, L.A., Njiraini, N, Sayialel, K, Moss, C J, Poole, J, and Byrne, R W (2008). African elephants have expectations about the locations of out-of-sight family members. *Biology Letters.* Feb. 23. 4(1): 34-36.

Bateson, M., and Matheson, S.M. 2007. Performance on a categorization task suggests that removal of environmental enrichment induces 'pessimism' in captive European starling (*Sturnus vulgaris*). *Animal Welfare* 16S: 33-36.

Bekoff, M., and Pierce, J. 2009. *Wild Justice: The Moral Lives of Animals.* Chicago: University of Chicago Press.

Beston, H. 1971 (1928). *The Outermost House: A Year of Life on the Great Beach of Cape Cod*. New York: Ballantine Books.

BBC (British Broadcasting Corporation). 2004. Sheep like smiles say researchers. 11 June. Available online at: http://news.bbc.co.uk/2/hi/uk_news/england/cambridgeshire/3796017.stm

Broom, D.M., Sena, H., and Moynihan, K.L. 2009. Pigs learn what a mirror image represents and use it to obtain information. *Animal Behaviour* 78: 1037-1041.

Brosnan, S.F., and de Waal, F.B.M. 2003. Monkeys reject unequal pay. *Nature* 425: 297-299.

Bshary, R. 2006. Machiavellian intelligence in fishes. Pp. 223-242 in: Brown, C., Laland, K. and Krause, J. (Eds). *Fish Cognition and Behavior*. Oxford: Blackwell Publishing.

CIWF (Compassion in World Farming). 2003. *Stop—Look—Listen: Recognizing the Sentience of Farm Animals.* Hampshire, UK: CIWF Trust.

Collias, N.E. 1987. The vocal repertoire of the red junglefowl: A spectrographic classification and the code of communication. *The Condor* 89: 510-524.

Engh, A.L., Beehner, J.C., Bergman, T.J., Whitten, P.L., Hoffmeier, R.R., Seyfarth, R.M., and Cheney, D.L. 2006. Behavioral and hormonal responses to predation in female chacma baboons (*Papio hamadryas ursinus*). *Proc Biol Sci* 273: 707-712.

FAO (Food and Agriculture Organization of the United Nations). 2006. Livestock's long shadow: Environmental issues and options. Rome: FAO.

Foote, L.A., Crystal, J.D. 2007. Metacognition in the rat. *Current Biology* 17: 551-555.

Gyger, M., and Marler, P. 1988. Food calling in the domestic fowl, *Gallus gallus*: the role of external referents and deception. *Animal Behaviour* 36:358-365.

Frederiksen, J.K., and Slobodchikoff, C.N. 1991. Referential specificity in the alarm calls of the black-tailed prairie dog. *Ethology Ecology & Evolution* 19: 87-99.

Inoue, S., and Matsuzawa, T. 2007. Working memory of numerals in chimpanzees. Current Biology, 17: R1004–R1005.

Janik, V.M., Sayigh, L.S., and Wells, R.S. 2006. Signature whistle shape conveys identity information to bottlenose dolphins. *Proc Nat Acad Sci USA* 103: 8293-8297.

Jarvis, E.D., Güntürkün, O., Bruce, L., Csillag, A., Karten, H., Kuenzel, W., Medina, L., Paxinos, G., Perkel, D.J., Shimizu, T., Striedter, G., Wild, M., Ball, G.F., Dugas-Ford, J., Durand, S., Hough, G., Husband, S., Kubikova, L., Lee, D., Mello, C.V., Powers, A., Siang, C., Smulders, T.V., Wada, K., White, S.A., Yamamoto, K., Yu, J., Reiner, A., and Butler, A.B. 2005. Avian brains and a new understanding of vertebrate brain evolution. *Nature Reviews Neuroscience* 6: 151-9.

Kendrick, K.M., da Costa, A.P., Leigh, A.E., Hinton, M.R., and Peirce, J.W. 2001. Sheep don't forget a face. *Nature* 414: 165-166.

McRae, F. 2008. I'm the chimpion! Ape trounces the best of the human world in memory competition. *Daily Mail,* January 26.

Parr, L.A., and de Waal, F.B.M. 1999. Visual kin recognition in chimpanzees. *Nature* 399: 647.

Pellis, S. 2002. Keeping in touch: Play fighting and social knowledge. In Bekoff, M., Allen, C., and Burghardt, G.M. (Eds.) 2002. *The Cognitive Animal*. Cambridge, Mass: MIT Press.

Pollan, M. 2001. *The Botany of Desire: A plant's-eye view of the world*. Random House, NY.

Primatt, H. 1776. *A Dissertation on the Duty of Mercy and the Sin of Cruelty to Brute Animals*. London, digitized by Google.

Range, F., Horn, L., Viranyi, Z.S., and Huber, L. 2009. Effort and reward: Inequity aversion in domestic dogs? *PNAS* 106: 340-345.

Wanker, R., Sugama, Y., and Prinage, S. 2005. Vocal labeling of family members in spectacled parrotlets, *Forpus conspicillatus*. *Anim Behav* 70: 111-118.

Webster, J. 2006. Animal Sentience and Animal Welfare: What is it to them and what is it to us? *Applied Anim Behav Sci* 100: 1-3.