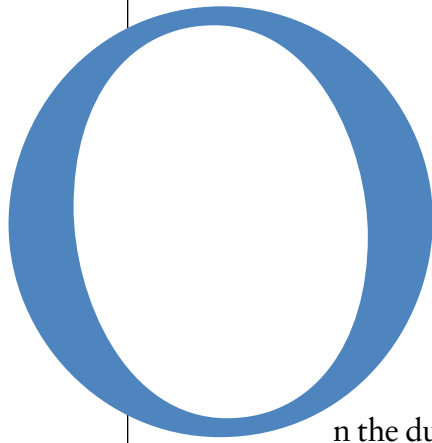


Animal lovers insist their fellow creatures
experience joy, sympathy, fear and grief,
but scientifically, it is hard to say
By Klaus Wilhelm

Do Animals Have **FEELI**



NGS?



n the dusty horizon, two troops of elephants emerge 100 yards apart and walk toward each other. The beasts trumpet loudly, flap their ears and turn in circles. They seem to know one another—the whole event appears to be a family reunion.

Anyone who travels the African savanna is apt to have witnessed such a meeting. In her decades of fieldwork, Joyce H. Poole, research director for the Amboseli Trust for Elephants in Kenya, has watched similar encounters many times. “These elephants,” the biologist says with conviction, “are happy to see their old friends and acquaintances.”

Investigators have also watched as a herd gathers around a stillborn calf. The pachyderms repeatedly touch the dead infant with their trunks, as if to rouse it. Then for days they stand vigil, with drooping ears. At other times, when a herd member is sick or wounded by a hunter, they caress the victim, offering support, and care for it until it is restored to health or dies.

Other animals seem to show emotions. Roughhousing chimpanzees emit sounds characteristic of joy and laughter. Dogs yelp to spur other dogs to play, and researchers who have played recordings of these sounds in kennels and shelters have shown that the noise can reduce stress levels in the animals there. Even laboratory rats make seemingly delighted chirps above the range of human hearing when tickled, some experts say.

Individuals who claim animals have feelings are usually accused of anthropomorphism—attributing human traits to nonhuman beings. But after years of ignoring or discounting what pet lovers have long maintained, scientists are finally beginning to believe that mammals, at least, have

some form of emotions—and investigating them is now a hot topic.

Anxious about Emotions

Some eminent scientists have boldly explored the riddle of animal emotions. Charles Darwin, the English naturalist and father of evolutionary theory, wrote an entire book entitled *The Expression of the Emotions in Man and Animals*. No one can deny that animals have emotions, he concluded, given the striking similarities between human and animal behavior. But in the century that followed the book’s publication in 1872, a reductionist view took hold: bees, frogs, cats and all animals are merely organisms that follow hardwired, instinctual behavior patterns. They are devoid of feelings.

Recently, however, a more nuanced view has begun to gain credence, sparked by the question of what survival advantage humans, or animals, gain from emotions anyway. According to Darwinism, every organism has one overriding goal: to reproduce, as well and as often as possible. For worms, insects or jellyfish, following a predetermined pattern of behavior in pursuit of this goal might be sufficient to achieve it. But for fish, reptiles, birds and vertebrates, behavior is less routinized. Ultimately, mammals are extremely flexible, and as such their activity cannot just result from hardwired templates. How, then, do rats, goats, apes, elephants and humans know which actions will best guarantee survival and reproduction? Among other cues, they may use emotions.

This statement, that an animal may “use emotions,” only demonstratively means that its brain reacts to certain events in certain ways—a net-

(The Author)

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Joy is a primary emotion, along with anger and sadness.

Young mammals play to learn skills. But it is the fun that ensures that they play.

work of neurons fires, initiating a predictable behavior. An animal will avoid situations that, in the past, made it feel threatened. Likewise, a creature that associates a positive experience with a certain action will seek the same one in the future. So far, so good. But does that animal feel in the course of things? This point is where the experts disagree.

A basic part of the discussion turns on the definition of emotion and feelings. Psychologists and neurologists do not even concur for humans, much less for animals. In his 2003 book *Looking for Spinoza*, influential neuroscientist Antonio R. Damasio of the University of Iowa lays out an increasingly popular scheme that distinguishes between primary, almost instinctive emotions; social emotions that help an individual mesh with a group; and feelings, which stem from self-reflection.

Primary emotions include fear, anger, disgust, surprise, sadness and joy, and Damasio ascribes them to many animals. Even the primitive sea slug *Aplysia* shows fear. When its gills are touched, its blood pressure and pulse go up and it shrivels in size. These are not reflexes, Damasio says, but elements of a fear response—complex, mutually dependent reactions. He emphasizes, however, that such organisms do not produce feelings. To Damasio and many others, emotions are physical signals of the body responding to stimuli, and feelings are sensations that arise as the brain in-

terprets those emotions. In humans and sea slugs, heart rates increase and muscles contract when the organisms are afraid of something, but an organism registers the feeling of fear only after its brain becomes aware of the physical changes.

For social emotions, Damasio lists sympathy, embarrassment, shame, guilt, pride, envy, jealousy, gratitude, admiration, contempt and indignation. These are not limited to humankind either. Dominant gorillas swagger around to demand respect from their peers. Low-ranking wolves in packs make gestures of abasement. Dogs reprimanded by their owners for doing something wrong show clear signals of embarrassment. Yet even in such cases, as with primary emotions, some neuroscientists say these actions



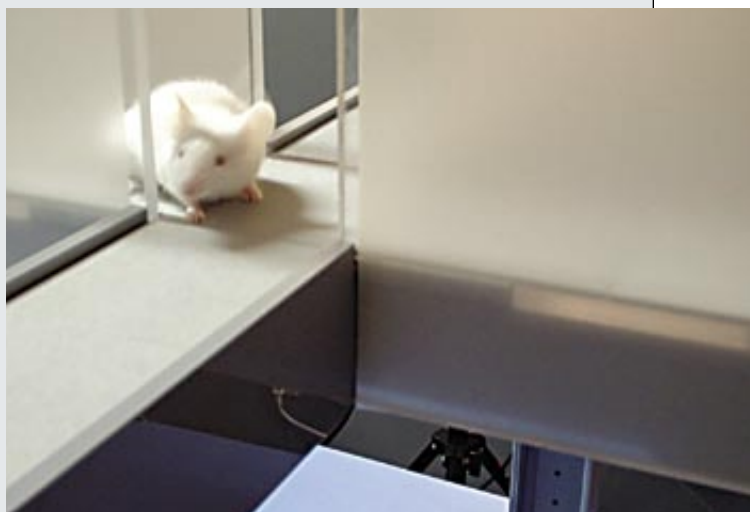
Indignation is a social emotion, as are jealousy and pride.

DANIEL J. COX Getty Images (top); DANIEL DAY Getty Images (bottom)

Nothing to Fear but Fear Itself

The pharmaceutical industry assumes that animals can feel fear in the same way people do. Otherwise it never would have spent millions of dollars on mouse experiments in the search for drugs to combat anxiety. Fear has been better studied than any other animal emotion.

The degree of fear mice feel can be quantified using the “elevated plus maze test.” A pole about a yard high has four arms extending out horizontally, each one at a right angle to the next (*photograph*). Two of the arms have walls to prevent falling, but the other two arms are open. If a mouse makes a false step on an open arm, it will fall hard. Most mice placed at the middle of the maze will choose to move out along a protected arm. If mice are given a drug that reduces anxiety in people, however, they will readily move out along the open arms. —K.W.



are largely automatic and inborn and count them among the routinized mechanisms animals use to help them survive.

Ancient Reflection

Feelings, in contrast, well up from the analytical mind. Someone who “feels good,” who experiences joy, is aware of her body being in a particular state. The perception of such a feeling requires processing by several somatosensory brain regions in the cerebral cortex that map parts of the body and their condition and, simultaneously, brain activity that assesses what those conditions mean. In essence, this processing constitutes self-reflection, which can occur either slowly or very fast.

It is difficult to prove that animals possess the capacity for self-reflection. Damasio theorizes that pygmy chimpanzees, for example, may be able to show the social emotion of pity for other animals but that they do not realize they are exhibiting pity. Given this inability to confirm what is happening in an animal’s head, Damasio is reluctant to imply that it possesses feelings.

Other experts are willing to entertain the notion. Jaak Panksepp, a renowned behavioral scientist at Bowling Green State University, agrees that only humans can think about their feelings, thanks to their highly developed neocortex. And only humans can manipulate and feign feelings, as politicians and actors do. But he does not believe feelings arise only from reflection.

Panksepp postulates that the roots of emotions lie in brain regions such as the limbic system

that are much older in evolutionary history and that we share with all mammals. He points, for example, to a recent research study led by Naomi I. Eisenberger of the University of California, Los Angeles. Eisenberger used functional magnetic resonance imaging (fMRI) to monitor the brain activity of subjects who felt socially excluded. Volunteers were asked to take part in a virtual ball game on a computer screen and told that two other participants hidden from view were also playing. In reality, the two “others” were simply icons controlled by a computer program. In the game, the three players were to toss a virtual ball back and forth, but the two computer-controlled “people” passed only to each other, ignoring the live person watching them on the screen. The volunteers later told the researchers that the experience of being excluded had felt hurtful.

The fMRI scans taken during the snubbing showed significant activity in several brain regions, especially the anterior cingulate cortex. Previous studies by others have indicated that people placed in situations that made them sad showed unusual activity in the thalamus and the brain stem. These regions play key roles in the limbic system—the area of the brain that produces and regulates emotion.

Joy and Play

Interestingly, young guinea pigs that are prematurely separated from their mother exhibit heightened activity in the same brain system. In Panksepp’s view, the feeling of being alone and vulnerable, and the stress it creates, reflects an-

cient mechanisms that are the foundation for the feeling of sadness experienced by humans. The limbic system is an ancient brain structure, and its central role shows that emotion is an integral part of animal life.

Biologists who have long observed signs of joy among animals agree. In the rain forests of Sumatra, orangutans swing from branches and splash their hands into pools of water with no other apparent purpose than just for the fun of it. In Alaska, ravens lie on their backs and slide down snow-covered rooftops, for no utilitarian reason. Buffalo in North America roar loudly as they deliberately slide across frozen patches of grass. Young macaques on the Japanese island of Honshu make snowballs in winter and play.

It is well accepted that young mammals have an inborn drive to play, because the interaction helps them sort out social opportunities and limits. They learn skills that will be important to their later survival. But what motivates them to goof around in the first place? Marc Bekoff, a biologist at the University of Colorado at Boulder who has researched the topic extensively, says it is the fun itself that ensures that animals will play.



Feelings, such as happiness, arise from the mind's awareness of bodily emotions.

(Animals don't have to have the same feelings humans do. They can be happy in different ways.)

Studies of brain metabolism provide evidence that animal feelings may not be very different from those in humans, because similar physical brain processes underlie those experiences. Experiments show, for example, that the neurotransmitter dopamine has an especially important part in the processing of emotions such as joy and desire in humans—and in other mammals.

In the end, it is not possible to prove through observation whether an animal possesses conscious feelings—no more than we can be sure about what another person is truly experiencing inside. We know from lab work that some animals, at least, are indeed self-aware, so it is not much of a stretch to think they could be cognizant of their emotions, too. Bekoff emphasizes that when we talk about animal feelings, they do not have to be the same kind that people have. Humans can be happy in ways that vary from person to person. Animals likewise could be happy in different ways from humans.

Animals and humans could indeed share pride, joy, grief and shame, too. Psychologist Marc

Hauser of Harvard University once surreptitiously observed a male rhesus monkey that, after copulating with a female, paraded around—until he tripped over an uneven patch of flooring and fell down. The monkey immediately and anxiously looked around before he got up—seemingly embarrassed about his stumble. Only when he was sure that no one had seen him did he get up and strut off—with his back straight and head held high—as if nothing had happened.

For Bekoff, the new research findings have not just a scientific message but also a social one: if animals are capable of feeling emotion, then we have yet another reason to seriously consider how well we treat them. **M**

(Further Reading)

- ◆ **The Smile of a Dolphin.** Marc Bekoff. Discovery Books, 2000.
- ◆ **Minding Animals: Awareness, Emotions and Heart.** Marc Bekoff. Oxford University Press, 2002.
- ◆ **"Laughing" Rats and the Evolutionary Antecedents of Human Joy.** Jaak Panksepp and Jeff Burgdorf in *Physiology and Behaviour*, Vol. 79, No. 3, pages 533–547; 2003.