Available online at www.sciencedirect.com
SCIENCE DIRECT®
Consciousness and Cognition 14 (2005) 22–29
Consciousness and Cognition
www.elsevier.com/locate/concog

Guest Editorial

Toward a science of ultimate concern

The existence of consciousness in other animals has remained a contentious issue in science and medicine ever since Descartes brought us the ontological mischief of mind–body dualism. An extreme, albeit implicit, variant of this mode of thought exists in animal behavior research to this day. Animals continue to be granted bodily reflexes, a complex instinctual apparatus and fundamental learning abilities, but rarely experiential states (Rollin, 1998). Although such views have traditionally brought peace of mind to those who pursue a livelihood through the use of animals (Thomas, 1996), they should have provided little solace to those interested in the nature of the brain or the mind. Although we all appreciate that mental processes remain relatively invisible to the tools of science, they are no more so than electrons and gravity to the tools of physics. Behavioral scientists are simply more timid in accepting the weight of evidence and theoretical inference as a basis for scientific reasoning. Also, the neglect of consciousness is partly due to the fact that the emphasis in the field is so heavily weighted toward research on cognitive topics, especially learning and memory, where information-processing metaphors seem to suffice. Those perspectives begin to falter when it comes to the epigenetically integrated intrinsic tools for living that evolution provided organisms, such as basic emotional and other affective abilities. Evolution surely provided more than learning capacities to organisms so they could begin to coherently navigate and respond to the world before they had an appreciation of the contingencies of the environment. Primary-process consciousness may be closely linked to some of these unconditioned responses, some of which, such as vocalizations can be used as self-reports of affect in animals (Knutson, Burgdorf, & Panksepp, 2002; Panksepp, Knutson, & Buradorf, 2002).

On the basis of first principles, it is quite unlikely that consciousness is a learned feature of brain organization. It could well be that the cerebral sources of conscious experience are more critically linked to the evolved aspects of brain dynamics—intrinsic value guides for existence—rather than to the abundant learning that proceeds rather automatically and unconsciously once organisms begin to confront real-life contingencies. After all, human minds dwell readily on, and seek out, aspects of the world that are critically linked to survival issues. How do animals ''know,'' in highly variable environments, that certain aspects of the world sustain life, while others detract therefrom? Might they not be ''agents'' of actions, as opposed ''scarecrows'' responding to world events? The simple answer has always been that human animals are utilitarian, because

1053-8100/$ - see front matter
doi:10.1016/j.concog.2004.10.002

life-affirming events feel good, and life-detracting events, feel bad. As utilitarian Jeremy Bentham said in 1789, "utility" reflects "that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness ... or ... to prevent the happening of mischief, pain, evil, or unhappiness" (*Introduction to the Principles of Morals and Legislation*).

Of course, now we know that these feelings are not properties of external objects, but the evolved nature of our brains. Thus, a more sophisticated answer is that we and our fellow animals are inheritors of various tools for living that neurobehaviorism, the now prevailing school of thought in functional neuroscience, is still too timid to conceptualize (Panksepp, 1990). In any event, a key issue about animal consciousness is whether other mammals experience emotional and motivational values in ways not dissimilar our own diversity of basic affective feelings. Except for studies of fear conditioning, there has emerged little institutional devotion to the study of brain mechanisms relevant for understanding affective processes in non-human animals. However, even in well-funded areas such as fear conditioning, there is scarcely an investigator who dares explicitly address the ever present worry—do animals experience fear? In the current intellectual climate (hopefully the tail-end of Cartesian dualism), it still does not pay to consider such issues (for critique, see Panksepp, 2002). However, if such brain processes do exist, we may never understand the sources of behavior until we begin explicitly to consider such options and then to study the relevant brain processes with more devotion than ever emerged in the past century.

It would be a lonely and peculiar world if we humans were the only conscious species on the face of the earth. Despite recent efforts to recognize cognitive variants of consciousness in animals (Griffin, 2001), all too many behavioral experts are still unwilling to explicitly acknowledge the high probability that many other animals are, in fact, conscious beings and thereby to promote experimental work on such topics. This is understandable from an epistemological perspective—taking sides on questions that cannot be easily resolved empirically is not an attractive option for scientists to consider. It is generally deemed wiser to wrap oneself in a cloak of agnosticism—an ontologically superficial stance that often makes us behavioral scientists seem more foolish than we are, especially in the eyes of many intelligent animal lovers whose opinions may better reflect nature's ways—individuals who are not about to back down on such issues of ultimate concern (Bekoff, 2000). Of course, as our body of substantive knowledge increases, all ontological positions need to be re-molded by accruing empirical advances. At this point, I adhere to a *dual-aspect monism* perspective (certain aspects of mind and instinctual behavior are opposite sides of the same neural coin), for that is the only way not to be immoblized in the animal consciousness laboratory. Here, I will argue that we may already have reached a point in our intellectual history where the denial of consciousness in animals is as improbable as the pre-scientific anthropocentric view that the sun revolves around the earth or that the "soul" is something other than a neurobiological process. However, too many scientists across too many generations have too willingly assumed a mantle of disbelief about such matters (without contemplating all the available evidence), so we may now have as much of a social as a scientific problem on our hands.

It would be good if there were a solid basis for a new and shared consensus on this contentious topic, for that could facilitate many new and important research initiatives. My goal here is to coax the field at large to consider emerging scientific ways to conceptualize the core emotions and affective experiences of other animals, and thereby humans as well. There is now enough sound argumentation and abundant data to allow all reasonable behaviorists to remove their shrouds of agnosticism, and to provisionally accept the default position that has long seemed

evident to many thoughtful observers who are not as constrained by the rigors of experimental evidence as scientists need to be: namely, it is evolutionarily more coherent to entertain the working hypothesis that all other mammals (and probably many other creatures as well) do have experiential states that help guide their behavior than to work from the premise that they do not. This could open up the field to new types of empirical inquiries, some of them unimagined through most of the 20th century (e.g., Panksepp & Burgdorf, 1999, 2003).

Classical behaviorism, still very much alive in behavioral neuroscience, chose to assert that there was nothing to weigh and measure in the realm of mental constructs, and hence chose to actively disregard such spooky, and supposedly superfluous, matters (Panksepp, 1990, 2000). Some impaled themselves on the horns of the dilemma of how immaterial mind processes might ever control physical processes without contemplating and affirming that mind is a complex physiochemical process of wide-scale brain–body neurodynamics. This is a pity, for a detailed understanding of primary process consciousness in humans may only be obtained by studying the relevant brain mechanisms in other animals where the necessary neuroscientific work can be conducted in sufficient detail. Contrary to what used to be asserted rather too boldly during the classic behaviorist era, there is now an emerging consensus that the "black box" must be probed to understand behavior. However, there is still widespread denial that a study of psychological processes in animals is an aspect of nature that needs to be opened up for scientific inquiry and discussion.

In the arena of drug addiction, where self-report measures in animals are emerging (Panksepp et al., 2002) we might well ask "Would individuals exhibit addictive behaviors if there were no affective payoffs?" (Panksepp, Nocjar, Burgdorf, Panksepp, & Huber, 2004, p. 93). My own answer to that question is "Clearly the answer is no—and not just for our own species." Considering that flies react to such drugs, and even planaria and crayfish prefer places where they received cocaine and amphetamine (see Panksepp & Huber, 2004), we must now contemplate how widely affective experience may be distributed in animal life. To not actively consider such possibilities, only sustains a neo-dualistic chasm between our increasingly rich neuro-behavioral work on the brain substrates of animal responses and/or actions and the mental products of such neurodynamics within human lives. Credible bridging principles are possible, and hopefully they will become ever more welcome, as we emerge, ever so slowly, from the century-long denial of neuro-mental faculties in 20th century animal brain research.

There are, of course, potential scientific as well as social costs and benefits involved with retaining or discarding the cloak of agnosticism. With sustained agnosticism we can avoid difficult ambiguities concerning the nature of mental realities, perhaps ultimately unknowable to us in any fine detail. However, by being too religiously agnostic, we may also seal doors to the discovery of relevant new knowledge about how the brain/mind is truly organized. On the other hand, by shelving traditional agnosticism and provisionally accepting common wisdom—that animals do have experiential feelings of their own—we may open up a Pandora's box of confusions that could be hard to close, even as we are again accepted by the broader society as defenders of naturalistic wisdom as opposed to being regarded, too commonly, as purveyors of pretentious academic positions. One obvious advantage of agnosticism is that the stance can be efficiently deployed to keep animal rights advocates at bay (and this may currently be the biggest implicit reason for equivocating about animal emotions ... especially in laboratories that stress their animals in ways that would be deemed morally reprehensible in humans).

However, the biggest problem with agnosticism is that if the brains of other animals are built around survival concerns that are encoded in affects, as our own mental apparatus seems to be, then we may never really understand how our own brains operate without a forthright confrontation with the neuro-evolutionary mystery of affective consciousness in other animals. It should be obvious that the details of the relevant biological mechanisms cannot be worked out in humans. Surely it would be an intellectual tragedy, indeed perhaps a continuance thereof, if neurobehavioral scientists were the last among concerned observers—among a highly diverse public interested in such topics—to recognize emotional experiences in the lives of other animals ... if, in fact, they do exist.

In my estimation, the weight has long favored the conclusion that many other animals do have various affective experiences that resemble our own, rather than the conclusion that they do not. The reason such naturalistic categories and dimensions of neuro-mental existence have never been adequately discussed or experimentally considered in neuroscience, is a fear of being tarred with the brush of anthropomorphism. But evolutionary theory suggests that our own unique mental faculties were surely built upon ancestral ones that existed before human walked the face of the earth (Panksepp & Panksepp, 2000), and scientific anthropomorphism should become increasingly useful for guiding work as we identify homologous structure-function relationships in mammalian brains (Panksepp, 2003a). Indeed, far-fetched as it may seem, it is certainly possible that our first-order sensory-perceptual consciousness was built upon the core values that were encoded as basic emotions and motivations at some earlier point in neural evolution.

As highlighted by this special issue of *Consciousness and Cognition*, we have again reached a time when it may be wise to re-weigh all relevant arguments and empirical approaches. For my own part, I will extend my discussion of affective consciousness in animals, which is, in my estimation, easier to understand than more cognitive variants of consciousness (Panksepp, 2003b)—easier because such state processes of the brain have massive circuitries and neurochemical codes that can be increasingly evaluated for affective properties in human beings (Panksepp & Harro, 2004). I also believe that cross-species behavioral brain research of this type is the optimal way to decode the neuro-evolutionary foundations of human consciousness, especially its basic affective and motivational underpinnings (Damasio, 1999; Panksepp, 1982; Panksepp, 1998). Unfortunately, the re-emerging tendency to make hard discriminations between emotional behaviors (which animals certainly have) and emotional feelings (which, according to some, only humans may have), is a strategy advanced by investigators of human emotions who may not wish to get bogged down on the topic of animal consciousness (e.g., Damasio, 1999, 2003; Dolan, 2002).

Those who pursue animal neurobehavioral research to gain insight into the underpinnings of human mind cannot avoid such issues as readily (Panksepp, 2003b, 2003c). For substantive future progress, we must attempt to deconstruct the conceptual prison–house that "never-mind" behaviorism created for the field (e.g., Panksepp, 1990, 2000). In my estimation, a scientifically coherent liberalization of our strictures against psychological analyzes of animal brain functions, at an institutional level (e.g., NSF and NIH), is long overdue. This could be achieved by permitting—even encouraging—investigators to discuss their results not only in traditional positivistic behavioral but also basic psychobiological ways (a proposal that is elaborated in my main contribution to the present issue–see Panksepp, 2005). Indeed, better answers to such

questions, in animal models, are essential ingredients for a scientifically coherent biological psychiatry (Panksepp, 2004). Animal brain research, properly conducted, has the best chance to inform us of the deep neural under pinnings of our own affective nature—those all important "ancestral voices of our genes" that may emerge from our genetically guided brain organizations interacting with the diverse life-sustaining affordances and life-detracting dangers of the world.

Because of advances in neuroscience, we can finally effectively triangulate among cross-species studies of brain, behavior, and mind, and make substantive progress on such topics. Since there is remarkably little ongoing work using such strategies, my aim is to promote enthusiasm for an interdisciplinary approach whose power remains underutilized and potential underestimated. My hope is that future generations of mind scientists develop the conceptual flexibility to discuss emotional and affective issues more openly than previous ones and to promote research on questions that have commonly been scorned in the behavioral community—the nature of those core biological values that emerge from ancient subcortical neural systems of mammalian brains. This obviously cannot happen until the extended community of mind scientists accepts, as axiomatic, a new, but not so radical, view of neuro-mental nature—that our affective experiences are deeply grounded in various ancient state-control process of the brain that we share with other animals, because of the evolutionary journey we shared in deep-time. Contrary to what generations of behaviorists have insisted, the topic of consciousness may not be as irrelevant for understanding animal behavior as is commonly still assumed.

Since proof-positive is impossible to obtain in this as in all such incredibly difficult areas of scientific knowledge, it is critical to weigh the evidence for various reasonable theoretical possibilities that are linked to workable epistemological strategies. My own goal has been to reveal the neural infrastructure of basic affective-emotional experiences in humans and other animals, a topic that has traditionally been derided in behavioral science and deemed too complex to be tackled by cognitive science (Norman, 1980; Panksepp, 1988). Although modern brain imaging has been rapidly changing that bias (e.g., Murphy, Nimmo-Smith, & Lawrence, 2003; Phan, Wager, Taylor, & Liberzon, 2002), such visually entrancing correlational approaches are only a preliminary step toward a more causal analysis, much of which is still best effected by behavioral brain research in other animals. Although there are robust strategies for pursuing the causal correlates of cognitive consciousness (Baars, Ramsoy, & Laureys, 2003), other strategies need to be taken to decipher affective consciousness (perhaps as described in my other contribution to this issue). Cross-species, experimental analysis, where key brain variables are evaluated, provides an approach that is not as full of false negatives and misleading "neuro-echos" as is modern fMRI. The interweaving of animal neurobehavioral and human neuropsychological research permits substantive dynamic analyses of the core emotions and their associated feelings. It is the animal research that is revealing many experimentally manipulable contributory variables (i.e., neurochemistries) that control basic emotional and motivational processes. There are now many pharmacological agents waiting in the wings to be evaluated for their affect modulating properties (Roques, 2000). All need to be studied experientially in humans using methodologies that take first-person subjective experience seriously (Panksepp, 1999).

Without coherent cross-species conceptual bridges between work on brain, mind, and behavioral functions, such practical "discovery" work will continue to be delayed. Psychologically informed behavioral brain research in animals can guide hypothesis-driven introspective studies of

human affective experiences (Panksepp & Harro, 2004). Thereby we may also get glimmers of the even more well-hidden subjective experiences of animals, especially in the realm of basic emotions and motivations where subcortical neurochemical homologies abound both at neuroanatomical and psychological levels. Only the perennial neo-dualistic possibility that all aspects of consciousness require higher human-specific neocortical circuits not possessed by other animals—potentially a "read-out fallacy"—prevents us from openly considering that a study of certain "instinctual" animal emotions may help us bridge toward an understanding of corresponding human psychological issues. Such an evolutionary strategy neither denies the many important differences that exist among species, nor the unique self-awareness permitted by our expansive cortico-cognitive thinking-cap. Other animals probably do not worry about their own mortality as we humans are prone to do, but they surely detect that they are hungry and thirsty and may even recognize having missed a scheduled meal. Animals clearly exhibit robust social preferences and aversions. Even laboratory rats enjoy people who treat them especially well, and dislike those that do not (as suggested by our preliminary evaluation of their ultrasonic self-reports—Knutson et al., 2002; Panksepp et al., 2002).

If it were the case that animals had no internal experiences—that they were without the varieties of emotional and motivational feelings so evident in their actions and expressions—there might be little reason, other than aesthetic ones, for us to be concerned about how we treat them. However, if their experiences of the world even remotely resemble our own, then we have profound reasons to reflect upon and to feel sympathy and responsibility for their life qualities—to respect them and to honor them for the many ways they contribute to our own quality of life (McMillan, 2005). Scientifically we may gain much and lose nothing, by accepting other animals into the circle of sentient life. Relevant hypothesis-driven questions can be pursued with rigorous scientific methodologies (Broom, 2001). Our traditional laboratory procedures and rules of inference would not change substantially, even though we may become more enthralled by psychologically relevant "network doctrines" of brain function rather than a mere "neuron doctrine" which has too fine a resolution to "see" affects in action. In the midst of such a metamorphosis, we would still have to recognize that much of mental life transpires at unconscious levels of neural processing.

More than anything, we just need to abandon various form of neo-dualism that still prevent us from trying to shed light on the deepest mysteries of existence in humans and other animals. As soon as we accept the possibility that dual-aspect monism may be a more reasonable, a more life-affirming and scientifically productive world-view than any form of "never-mind" neo-dualism, many of our conceptual errors, and resulting societal problems, may fade into the historical past. Most of our neuroscientific questions will not require consideration of such psychological subtleties, but discussions of behavioral output in mammals certainly will.

References

Baars, B. J., Ramsoy, T. Z., & Laureys, S. (2003). Brain, conscious experience and the observing self. *Trends in Neurosciences, 26*, 671–675.

Bekoff, M. (2000). Animal emotions: Exploring passionate natures. *BioScience, 50*, 861–870.

Broom, D. M. (2001). *Coping with challenge: Welfare in animals including humans*. Berlin: Dahlem University Press.

Damasio, A. R. (1999). *The feeling of what happens*. New York: Harcourt Brace.
Damasio, A. R. (2003). *Looking for Spinoza*. Orlando, FL: Harcourt.
Dolan, R. J. (2002). Emotion, cognition, and behavior. *Science, 298*, 1191–1194.
Griffin, D. R. (2001). *Animal minds: Beyond cognition to consciousness*. Chicago: University of Chicago Press.
Knutson, B., Burgdorf, J., & Panksepp, J. (2002). Ultrasonic vocalizations as indices of affective states in rats. *Psychological Bulletin, 128*, 961–977.
McMillan, F. D. (2005). *Mental health and well-being in animals*. Ames, IO: Iowa State University Press, in press.
Murphy, F. C., Nimmo-Smith, I., & Lawrence, A. D. (2003). Functional neuroanatomy of emotions: A meta-analysis. *Cognitive, Affective, and Behavioral Neuroscience, 3*, 207–233.
Norman, D. A. (1980). Twelve issue for cognitive science. *Cognitive Science, 4*, 1–32.
Panksepp, J. (1982). Toward a general psychobiological theory of emotions. *The Behavioral and Brain Sciences, 5*, 407–467.
Panksepp, J. (1988). Brain emotional circuits and psychopathologies. In M. Clynes & J. Panksepp (Eds.), *Emotions and psychopathology* (pp. 37–76). New York: Plenum Press.
Panksepp, J. (1990). Can "mind" and behavior be understood without understanding the brain?. *New Ideas in Psychology, 8*, 139–149.
Panksepp, J. (1998). *Affective neuroscience: The foundations of human and animal emotions*. London: Oxford University Press.
Panksepp, J. (1999). Emotions as viewed by psychoanalysis and neuroscience, An exercise in consilience. *Neuro-Psychoanalysis, 1*, 15–38.
Panksepp, J. (2000). On preventing another century of misunderstanding: Toward a psychoethology of human experience and a psychoneurology of affect. *Neuro-Psychoanalysis, 2*, 240–255.
Panksepp, J. (2002). The MacLean legacy and some modern trends in emotion research. In G. A. Cory, Jr. & R. Gardner, Jr. (Eds.), *The evolutionary neuroethology of Paul MacLean* (pp. ix–xxvii). Westport, CT: Praeger.
Panksepp, J. (2003a). Can anthropomorphic analyses of separation cries in other animals inform us about the emotional nature of social loss in humans? Comment on Blumberg and Sokoloff 2001. *Psychological Review, 110*, 376–388.
Panksepp, J. (2003b). At the interface of affective, behavioral and cognitive neurosciences. Decoding the emotional feelings of the brain. *Brain and Cognition, 52*, 4–14.
Panksepp, J. (2003c). Damasio's Error?. *Consciousness and Emotion, 4*, 111–134.
Panksepp, J. (Ed.). (2004). *Textbook of biological psychiatry*. New York: Wiley.
Panksepp, J. (2005). Affective consciousness: Core emotional feelings in animals and humans. *Consciousness and Cognition, 14*, in press.
Panksepp, J., & Burgdorf, J. (1999). Laughing rats? Playful tickling arouses high frequency ultrasonic chirping in young rodents. In S. Hameroff, D. Chalmers, & A. Kazniak (Eds.), *Toward a science of consciousness III* (pp. 124–136). Cambridge, MA: MIT Press.
Panksepp, J., & Burgdorf, J. (2003). "Laughing" rats and the evolutionary antecedents of human joy?. *Physiology and Behavior, 79*, 533–547.
Panksepp, J., & Harro, J. (2004). The future of neuropeptides in biological psychiatry and emotional psychopharmacology: Goals and strategies. In J. Panksepp (Ed.), *Textbook of biological psychiatry* (pp. 627–660). New York: Wiley.
Panksepp, J. B., Huber, R. (2004). Ethological analyses of crayfish behavior: A new invertebrate system for measuring the rewarding properties of psychostimulants. *Behavioural Brain Research, 153*, 171–180.
Panksepp, J., Knutson, B., & Burgdorf, J. (2002). The role of brain emotional systems in addictions, A new neuro-evolutionary and new self-perspective report animal model. *Addiction, 97*, 459–469.
Panksepp, J., Nocjar, C., Burgdorf, J., Panksepp, J. B., & Huber, R. (2004). The role of emotional systems in addiction: A neuroethological perspective. In R. A. Bevins (Ed.), *50th Nebraska symposium on motivation, motivational factors in the etiology of drug abuse* (pp. 85–126). Lincoln: Nebraska, in press.
Panksepp, J., & Panksepp, J. B. (2000). The seven sins of evolutionary psychology. *Evolution and Cognition, 6*, 108–131.
Phan, K. L., Wager, T., Taylor, S. F., & Liberzon, I. (2002). Functional neuroanatomy of emotion: A meta-analysis of emotion activation studies in PET and fMRI. *Neuroimage, 16*, 331–348.

Rollin, B. E. (1998). *The unheeded cry: Animal consciousness, animal pain and science*. Ames, Iowa: Iowa University Press.
Roques, B. P. (2000). Novel approaches to targeting neuropeptide systems. *Trends in Pharmacological Sciences, 21*, 475–483.
Thomas, K. (1996). *Man and the natural World*. New York: Oxford University Press.

Jaak Panksepp
Department of Psychology
Bowling Green State University
Bowling Green, OH 43403, USA
E-mail address: jpankse@bgnet.bgsu.edu

Available online 10 December 2004