

MONKEY BUSINESS:

EMOTION AND CONSCIOUSNESS IN PRIMATES

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I couldn't help but smile in the final scene of the 1968 sci-fi classic, *Planet of the Apes*. The female chimp asks, "What will he [the astronaut] find out there, doctor?" and the doctor chimp answers in a slight British accent, "His Destiny." In today's world, how far are chimps from conceiving of a "destiny?" Very far. But primates may be at a distinct advantage over other mammals on their journey to becoming philosophers. Primates show us time and time again that they at least have emotions, if not the consciousness to recognize them. The following is an episode summary from *Animal Planet's Orangutan Island*, a unique show detailing the lives of 32 captive orangutans. Hamlet is a dominant male on the island:

"There's calm since Hamlet's return, but it is mostly an uneasy peace between the ... orangutans. Stirring up trouble, delicate outsider Mangis zeros in on an unsuspecting Jordan for his food sack, but Jordan isn't afraid to defend what is rightfully his. Conflict between the two communities transforms into a perilous contest in which Jordan could lose his life" (Discovery Communications 2008).

Pet owners, zoo goers, and *Animal Planet* fans alike have all experienced a moment where they felt it was very clear what an animal was feeling. A gorilla beating its chest in anger, a rhesus monkey furrowing its eyebrows in confusion, and a chimpanzee calling out in fear are all common occurrences of animal emotion in primates. *Animal Planet's* interpretation of Jordan's bravery would be considered blatantly anthropomorphic by many scientists. Anthropomorphism is the false projection of human

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Figure 1. Perhaps it is not so far-fetched to see animals with emotions as people have ascribed it to be. In fact, the possibilities described in the *Rise of the Planet of the Apes* may be closer to reality than today's notions. The above picture is a scene from the *Rise of the Planet of the Apes*.

capabilities onto animals, such as in the Betty Thomas' *Doctor Dolittle* (1998), Andrew Stanton's *Finding Nemo* (2003), and the vast majority of all Disney movies. Yet, if science is the study of the natural world, why do many scientists reject observations of animal emotion rather than using them as a starting point in the investigation of animal consciousness?

The question of animal consciousness has such deep implications into the human psyche that for some, conceding animal consciousness blatantly undermines the will of god. Consciousness and emotion, to some people, are uniquely human traits that can only be generated in the process of human development—a claim that is, for the most part, substantiated by the fact that human minds are far superior to those of the world's most intelligent primates.

Studies in evolution suggest, however, that because emotion and consciousness are such complex and advantageous mechanisms, it is likely that their origins can be traced farther back than the phylogenetic split between primates and humans. Studies in animal empathy also support the suspicion of consciousness in primates, because they demonstrate that primates have "theory of mind," or the ability to conceive of the mental faculties of other beings. Theory of mind is a good indicator of

consciousness, because it requires the individual to have a sense of self, a sense of the other, and a self awareness of one's own emotions.

Much of the debate over animal emotion is fueled by a misunderstanding about what emotion actually entails. Specifically, many who dismiss the idea as anthropomorphic are mistakenly lumping the idea of emotions with consciousness of those emotions. Marc Bekoff, in *Animal Emotions: Exploring Passionate Natures*, points out that Darwin himself, who was wary of conceding animal consciousness, admits that "there is continuity between the emotional lives of humans and those of other animals, and that the differences among many animals are in degree rather than kind" (Bekoff 2000, 861).

Emotions are purely biological responses to external and internal stimuli. When an emotion is induced, it causes changes in numerous involuntary mechanisms, such as heart rate, digestion, hormonal levels, etc. These chemical changes result in the characteristic modifications in facial features, body posture, and internal regulators that are eventually used by other beings to detect emotions. Antonio Damasio, a highly acclaimed humanist and neuroscientist, mirrors the sentiments of his peers when he suggests that emotions have two main purposes in a scientific context. He argues that "The first function is the production of a specific reaction to the inducing situation" (Damasio 1999, 55). To illustrate this, let us suppose that someone is being attacked by another human. If they are angry at the attacker, they are more inclined to fight them in this life threatening situation, which is evolutionarily advantageous. He continues, "the second biological function of emotion is the regulation of the internal state of the organism such that it can be prepared for that specific reaction" (Damasio 1999, 55). That is, they are more effective in defense if their attacks are fueled by anger, because energy normally spent on bodily functions such as digestion are redirected to muscles of their extremities so that they can fight with more force. Thus, animals having emotion would make evolutionary sense, because an emotion helps one carry out actions for survival more effectively, regardless of whether or not the animal is conscious of those emotions. An animal needn't be aware of its anger for the anger to result in a stronger attack.

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The recognition of those emotions by the organism's brain is evidence for self-awareness, or consciousness. A recognition of present and past emotions results in the ability to integrate past experiences into our decision making process, which will be discussed later. Accordingly, as our consciousness develops from birth through early childhood, so does our emotional intelligence.

Experiencing sadness is different than knowing that one is experiencing sadness. This distinction is vital to the study of animal consciousness. Nonconscious emotions, or ones that are not detected by the brain, can even be recorded in humans. Such instances are evidence of the fact that emotions do not necessitate consciousness.

Damasio conducted an experiment on a patient who had severe brain damage that prohibited him from learning anything new, including sounds, tastes, people, occurrences, etc. For one week, scientists had him interact with a "good guy," who treated him very nicely and complied with all of his requests, a "neutral guy," and a "bad guy," who treated him rudely and said no to every single one of his requests (Damasio 1999, 41). Later, when he had zero recollection that he had even met these people, he was asked who he would most likely go to as a friend or if he had a request. He consistently chose the good guy over anyone else. The patient had clearly associated the visual representations of the good, neutral, and bad guys to emotions of happiness and pain, respectively. The scientists concluded that the mind uses emotions, even if they are nonconscious, like those of this patient, to link actions and outcomes of those actions in order to anticipate what the better choice will be next time (Damasio 1999).

Manipulating our actions to enhance survival is the essence of learning, which furthers the idea that emotions are evolutionarily advantageous. Nonconscious emotions are entirely plausible in animals because at their core, emotions are biological mechanisms that rely on equipment not unique to humans. It has been reported that the neocortex, which processes sensory input, accounts for 75% of the total brain volume in chimpanzees and 80% in humans (Budiansky 1998). Processing of sensory input is the major avenue by which inducers are able to cause emotion. As opposed to 30% of the brain volume in hedgehogs, the relatively small difference between humans and chimps may result in the wide

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diversity of human emotions.

Consciousness, in addition to emotion, is supremely advantageous for multiple reasons. It is the ability to integrate the images one has comprehended into the decision-making process; thus, the choice and delivery of actions are more informed. Additionally, a side effect of recognizing one's own emotions is sometimes being able to recognize others' emotions.

Psychologist Nicholas Humphrey believes consciousness is most useful because we can use the awareness of our own emotions to predict others' actions (Cartmill 1998). Consciousness involves simultaneously knowing oneself and comprehending the constant flow of images, internal and external, that one encounters. This is a tremendous energy expenditure. Cartmill offers the insight that the evolutionary price of consciousness is periods of total unconsciousness, or sleep, during which an organism is vulnerable (Cartmill 1998). Therefore, if consciousness were not evolutionarily favorable as elaborated above, it surely would have died out by now. Many animals other than primates go through periods of sleep—this supports the model that consciousness is found at many different levels on the hierarchy of animal complexity; it is not an all or nothing phenomenon.

In the evolutionary scheme, hominids only split off from chimpanzees four to eight million years ago. Even after this divergence, the first few hominids, *Australopithecus afarensis*, *africanus*, and *boisei*, had a brain only 1/3 the size of ours (Campbell, Reece, Mitchell 1999). Evolutionary history suggests that the adoption of a trait that we see in today's humans takes many millions of years to develop. We can see this trend in the appearance of the modern brain, the method of internal fertilization, and the opposable thumb, which are all large contributors to the modern mammal. The brain developed linearly, as groups of nerve cells, or ganglia, slowly increased in size. The distribution of brain size in the animal kingdom shows that even simple animals, such as lancelets, which split off from the ancestral chordate more than 520

million years ago, have the beginnings of a brain. In other words, the brain took at least 520 million years to develop. Furthermore, it is generally accepted that such largely recognizable traits, such as the opposable thumb, are not the result of one mutation, but rather a combination of many mutations, recombinations, etc. It is reasonable to believe that consciousness, with its multiple benefits, took significantly more than just four to eight million years or just one mutation to evolve into the complex mechanism that it is today. In line with all other trends in evolutionary development, we should at least be able to recognize the beginnings of consciousness in primates.

Evidence of consciousness in primates is generally scrutinized because it does not explicitly connect why certain behaviors are specifically linked to consciousness. Rather, the evidence is weakened by the fact that operant conditioning may account for so-called conscious learning. Operant conditioning is when a subject's behaviors are rewarded or punished repeatedly, which proves an ability to learn a causal relationship (i.e. pressing a lever causes the release of food). It does not prove that previous experiences have influenced the subject's ability to learn. However, if it could be shown that different individuals responded to the same situation in unique ways, the only explanation for such results would be that the animals are operating on different levels of experience. This would show that the animals are indeed able to record their past experiences and integrate them into their decision making process, a definite result of consciousness (Mills 1997). Cynthia Mills, in *Unusual Suspects (Deception in Animals)*, reports two experiments done by ethologist Emil W.



Figure 2. Although Menzel's research on primates yielded humorous pictures, their implications on primate cognition are profoundly serious: these animals actually have a sense of self, which is similar to what humans have.

Menzel and Andrew Whiten which demonstrate the intellectual difference between two primates:

On a number of occasions Menzel hid grapefruits and other food in a field, letting a chimp named Belle watch. When Menzel let other chimps into the field, Belle led them to the food. The problem was, Belle herself often did not get to eat: if a big, dominant male named Rock was around, he would drive her away from the food with bites and kicks.

So Belle got smart. She began going to the food and sitting on it. Then Rock got smart. If Belle sat in one place, he went over, drove her away and uncovered the food. Belle tried stopping before she reached the food. Rock followed and searched from where she stopped. Belle tried going in the wrong direction until she could see that Rock was not looking. Rock pretended not to look, or hid behind a tree to watch her, dashing out as soon as she went to the food. Eventually Menzel tried helping Belle by hiding a single piece of food in one place and a larger stash in another. Belle led Rock to the one piece and then, while he was eating, ran off and uncovered the large stash. When Rock started to ignore the single piece in favor of following Belle, she ran out of ideas. She had temper tantrums...

...Whiten then repeated what Menzel had done, using a young chimp named Mercury as the informed party and an older male named Sherman as the bully. Mercury did not try to draw Sherman away from the food, as Belle had done

with Rock. Instead he stayed away from the bananas until he had lured Sherman into an enclosure with a female. While they were enjoying a mutual grooming session, Mercury made a beeline for the bananas and had them all to himself. He not only invented a scheme entirely different from Belle's (proof that her deceptions were not preprogrammed); he invented a better one. (Mills 1997)

Realize that the way animals process past experiences is largely through emotions that they associate with them (i.e. Rock the chimp "remembers" to steal the food from under Belle, because the last time he did that, it resulted in the emotion of happiness for him). Integrating experiences into the decision making processes requires the awareness of one's own emotions (recall that this is the definition of consciousness).

Another commonly accepted consequence of consciousness is what scientists call "theory of mind," or the ability to conceive of the thoughts of another organism with the same mental faculties that the individual does. A well known experiment concerning this aspect of consciousness is Gordon Gallup Jr.'s "mirror test." In this test, chimps are exposed to a mirror, and their reactions are recorded. Then, they are anaesthetized and a red dot is put on their eyebrow. The reactions of the chimps to their own image in the mirror are then recorded again to see if the chimps touch the mirror or touch their eyebrow. They consistently touch their eyebrows, which lead Gallup to conclude (with references to other experiments) that they develop self-consciousness in pre-adolescence (Gallup 1998). This self-consciousness is a basis for the chimps being able to attribute mental states to others (which will be called empathy from here on out).

The ability to show empathy as a result of consciousness is in congruence with Humphrey's assertion that one large evolutionary advantage of consciousness is the ability to predict another's actions by reading their emotions. The test has been performed many times since, on an array of different animals, but only chimps, orangutans, and humans are able to pass the test consistently. Gallup suggests that gorillas, even though they too are part of the great ape family, cannot pass the test because as a social norm, they never look eye to eye with each other; therefore, the gorillas may be hesitant to look in the mirror at all (Gallup 1998).

Even critics of Gallup's methods, who asserts that the chimps are expressing "a motor self-concept rather than a psychological one," (Gallup 1998, 5) concede that chimps appear to understand what others know. Whiten, too, has shown incontrovertible evidence that chimps display theory of mind:

[Whiten] went to Georgia State University and set up a special test for a chimpanzee named Panzee... First Panzee would see a keeper hide food in one of two locked boxes. Then Whiten would enter and Panzee, to get some food, would have to indicate to Whiten which locked box the food was in. Whiten would unlock the box and Panzee would get the food. When Panzee could do that dependably, even

indicating the proper box by pointing--a skill chimpanzees do not readily learn--Whiten abruptly changed the scenario. Now Whiten hid the food and left. Next the keeper walked into the room and hid the key to the boxes. Whiten reentered. If Panzee had learned to get the food through trial and error alone, she would still have pointed to the box. Instead, on her first try, she pointed to where the key was hidden (Mills 1997).

Functions	Brain Region or Process	Humans	Primates	Sub-primate Mammals	Other vertebrates	Invertebrates
Sensation	Primary Sensory nerves	+	+	+	+	+
Perception	Thalamus and cortex	+	+	?	?	-
Attention	Thalamus and cortex	+	+	+	+	-
Emotion	Limbic Lobe	+	+	+	+	-
Instinct	Hypothalamus	+	+	+	+	+
Learning	Associative Neural Networks	+	+	+	+	+
Memory, orientation	Hippocampus, cortex	+	+	?	?	-
Language	Temporal Lobe	+	?	?	-	-
Action	Motor System	+	+	+	+	+

Figure 3. Hobson's idea of a gradient asserts that consciousness is not an all-or-none phenomenon. This table breaks consciousness into distinct functions in order to better understand such a gradient. Adapted from Hobson, J. Allen. Consciousness. New York, NY: W.H. Freeman and Company, 1999.

Observations of animal empathy, both in the informational context (I understand what you know) and the traditional context (I understand what you feel), are perhaps the most promising avenue of producing unequivocal evidence demonstrating animal consciousness, because empathy ties together two major components of consciousness: reading others' emotions and having theory of mind, which both require that the individual has a concept of themselves.

Mills finds in her study of animal deception, which she believes to be an indicator of animal consciousness, that there is a large gradient of capabilities. J. Allen Hobson, a leader in the study of consciousness, furthers that a gradient of consciousness is evident from low level to high level organisms, and details this with thirteen facets of consciousness, with the most intelligent nonhuman animals exhibiting eight of these components (89). Figure 1 shows a summary

of Hobson's compilation of many experiments which he believes demonstrate these eight components. "Even among the lowest invertebrates, four of the components are unequivocally present. These primary reflexive animals have relatively few neurons interposed between those conveying sensory signals in and motor signals out. But those neurons...are capable of generating remarkably well-organized behaviors" (Hobson 1999, 90). Hobson's work is a detailing of the manifestation of the gradient of consciousness across many species.

Consciousness as an all-or-none phenomenon, though still a popular belief, is becoming increasingly outdated as scientists break it up into more and more constituent parts. Animal consciousness as a symptom of anthropomorphism, in contrast, is decreasing in prevalence. Primates demonstrate time and time again that they have some level of consciousness, if only a small degree of emotional self awareness. In a way, Planet of the Apes has similar intentions to animal consciousness researches; the desire to make sense of the creatures with which humans feel a natural, undeniable bond.

REFERENCES
 Bekoff, Marc. 2000. Animal Emotions: Exploring Passionate Natures. BioScience 50, no.10: 861-870.
 Budiansky, Stephen. 1998. If a Lion Could Talk: Animal Intelligence and the Evolution of Consciousness. 1 ed. New York: Diane Publishing Company.
 Campbell, Neil A., Jane B. Reece, and Lawrence G. Mitchell. 1999. Biology. 5 ed. Glenview: Benjamin/Cummings.
 Cartmill, Matt. 1998. Animal Minds, Animal Dreams. Natural History, March.
 Damasio, Antonio. 1999. The Feeling of What Happens : Body and Emotion in the Making of Consciousness. New York: Harcourt Brace.
 Discovery Communications, LLC. E pisode Guide : Orangutan Island : Animal Planet. Animal Planet : Pets, Wild Animals, Dog Breeds, Cat Breeds. <http://animal.discovery.com/tv/orangutan-island/episode/episode.html>

(accessed June 18, 2010).
 Gallup Jr., Gordon. 1998. Can Animals Empathize? Yes. Scientific American, Winter.
 Hobson, J. Allen. 1999. Consciousness. New York, NY: W.H. Freeman and Company.
 Mills, Cynthia. 1997. Unusual Suspects. Sciences 37, no. 4 (July/August), <http://0-find.galegroup.com/mill1.sjlibrary.org/itx/start.do?prodId=EAIM> (accessed March 14, 2009).
 Panksepp, Jaak. 2004. Affective Neuroscience The Foundations of Human and Animal Emotions (Series in Affective Science). Illustrated ed. New York: Oxford University Publishing.

IMAGE SOURCES
<http://cdn.screenrant.com/wp-content/uploads/rise-planet-apes-john-lithgow.jpg>
http://notbadscience.files.wordpress.com/2011/09/chimp_mirror.jpg
 Hobson, J. Allen. Consciousness. New York, NY: W.H. Freeman and Company, 1999.
http://s4.hubimg.com/u/876603_f260.jpg
http://afflictor.com/wp-content/uploads/2011/09/Expression_of_the_Emotions_Figure_18.png
<http://libcom.org/files/monkey%5B2%5D.jpg> http://lh4.ggpht.com/-eh862Z-k4jL8/TAIEtgs1kl/AAAAAAAAAKA/1vNz_KtiVvk/spark1440.jpg