ANIMAL MINDS, ANIMAL DREAMS

by Matt Cartmill

Let me propose a thought experiment. Imagine that certain cells in the brain are necessary for consciousness. Then suppose that a certain drug paralyzes these cells, with no effect on the rest of the brain. People who take this drug behave as usual, but they experience nothing until it wears off. The drug converts them into sleepwalkers. Finally, imagine that a new form of this drug has PERMANENT effects, abolishing consciousness forever with no effect on behavior. I want to test it on you. How much will I have to pay you to take it?

The question answers itself. The value of life derives from our awareness of it. Spending your life as a sleepwalker is equivalent to being dead; so you would charge whatever it would be worth to you to commit suicide.

As the source of all value in our lives, consciousness should be at the top of the scientific agenda. Yet we know little about its evolution. Some scientists and philosophers believe that consciousness has no evolutionary history because they think people are the only creatures that have it. Although other scientists will often admit in private that our nearest animal relatives may have mental lives something like ours, many of them hesitate to say so plainly and publicly for fear of being accused of sentimentality and anthropomorphism.

To be sure, sentimentality and uncritical anthropomorphism are real temptations in dealing with animals, and scientists succumb as often as others. To guard against such lapses, the British psychologist C. Lloyd Morgan laid down the following law in 1894: "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale."

For Morgan, "higher" implicitly meant "human." Psychologists today were his dictum under the name of Morgan's Canon. Why do they so readily accept it? Why is it safer to assume that human brain functions are unique? People who study kidney evolution don't think it's anthropomorphic to interpret an animal's urine as the outcome of the exercise of higher kidney faculties.

One reason is that brain functions, unlike kidney functions, are markers of the boundary between animals and people. Because non-human animals lack many of our mental abilities, we regard them as property, to be used for our ends in any way we

choose-- from food for the dinner table to scientific experimentation. The only obligation we recognize to other animals is a duty not to make them suffer, and we acknowledge that duty only because we suspect that some animals are on our side of the other big line we draw across the moral landscape--the boundary between things that are sentient and things that aren't.

Scientists are often reluctant to talk about animal consciousness because it's not an observable property, and science deals only in public observations. So scientists who are interested in subjective awareness prefer to study the objective facts of neurology and behavior and try to convince themselves that this is somehow the same as studying consciousness.

The field of computer science called artificial intelligence grew out of these behavioristic assumptions. In 1950, the English computer theorist Alan Turing offered a classic test for telling whether machines can think. He called it "the imitation game." Suppose that we have a computer program that will exchange E-mail with you. If, after five minutes, you can't tell whether you've been chatting with a human being or a computer, then (said Turing) the machine can think--because that's what thinking means: being able to carry on a human conversation. Turing predicted that the huge (128 MB) supercomputers of the year 2000 would play his imitation game so well that "an average interrogator will not have more than a 70 percent chance of making the right

Turing's prediction hasn't worked out. Today, you can buy the supercomputer of Turing's dreams off the shelf at Sears, and far more powerful machines can be had at higher prices. But so far, none of them can play the imitation game very well. Because a computer lacks the experience of inhabiting the world in a living body, it's readily unmasked by asking questions that require a commonsense understanding of the world. (A computer can be more easily programmed to play chess than to handle a question like, "Can a sheep eat an anvil?")

Computer metaphors have nevertheless come to dominate the way we think about minds and brains. They predispose us to believe that mental events are algorithmic--that is, that they are produced by executing a string of logically connected instructions--and that digital computers (which are algorithm machines) will become conscious when we learn to run the right program on the right kind of hardware. There are reasons for doubting this. If simply moving electrical charges around in a certain pattern can bring a mind into existence, then I could get the same effects by sliding beads around on a gigantic abacus or making chalk marks on a blackboard. And since a digital computer is just another way of instantiating an algorithm, such a device is unlikely to become conscious.

If consciousness isn’t algorithmic, then how is it produced? We don’t know. The machineries of consciousness are still a mystery. We know a lot about how our nervous system processes and discriminates among stimuli. But although such sensory mechanisms are necessary for consciousness, we can perceive things and respond to them without being aware of them. The most spectacular example of this is sleepwalking.

In the living brain, waves of nerve-cell discharges travel across the surface of the cerebral cortex like ripples on water. These brain waves are fine and choppy when we're awake, but in sleep, the waves get slower, bigger, and more synchronized. They become slowest and biggest during deep sleep. Strangely enough, this is when sleepwalking occurs. Sleepwalkers--who comprise about 25 percent of all children and 7 percent of adults--may do dangerous and stupid things, like walking through glass doors or over cliffs. But they can also do complicated, distinctively human things: converse or drive away in cars.

The phenomenon of sleepwalking shows that you can get distinctively human behavior without consciousness. Some sleepwalkers could probably pass the Turing test. And if unconscious people can fool us, how can we be sure that animals aren't unconscious even when they seem to be awake? Do horses gallop in their sleep in the same way that a sleepwalker gets into a car and drives off at sixty-five miles an hour? And if we can do so many things while unconscious, then why did consciousness evolve?

One theory holds that consciousness is useful because it allows us to construct objects in our minds by combining the input from different senses. When we see a car drive past, we don't separately hear its motor and see its body and smell its exhaust. We perceive one single thing--a car passing by. Neurobiologists refer to this as the "binding" phenomenon. Most animals clearly don't have it. They have separate and very mechanical responses to the inputs from different sense receptors. For example, a frog is built to snap at any moving dark spot of a certain size. A frog will starve to death in the midst of a heap of freshly killed flies, because it doesn’t recognize them as flies, by vision or any other sense.

Some other animals do display binding. It seems to be a necessary condition of consciousness, but the phenomenon doesn't furnish proof of consciousness because it can evidently take place without conscious awareness. Sleepwalkers, for example, have been known to sit down and play the piano, which surely requires putting hearing, touch, and proprioception together.

Then what use is consciousness? If consciousness were useless, I think natural selection would have operated to get rid of it somehow, since we have to pay a high price for it. The price we pay for consciousness is unconsciousness, of the special and peculiar sort we call sleep. Sleep isn't just resting; it's a complicated and dangerous undertaking. Invertebrates and cold-blooded vertebrates don't do it. When they hide and rest, they show little or no change in brain activity. Only mammals and birds exhibit true sleep, involving a shift from fast to slow waves in the forebrain.

In both groups, slow-wave sleep is interrupted at intervals by so-called REM (rapid eye movement) sleep. In mammalian REM sleep, the body goes limp but the brain waves become fast and shallow again, and the closed eyes swing this way and that in synch with bursts of activity in the visual cortex and the ear muscles. The brain appears to be seeing and hearing things that aren't there. The human brain, at any rate, is doing just that, because REM sleep is often associated with dreaming.

Why do we sleep? Some argue that sleep serves to conserve energy, which is why only warm-blooded animals do it. But in fact, mammalian sleep uses just about as much energy as wakeful resting does. Another theory holds that sleep is a defense against predators, that it’s nature’s way of telling us to hide when we don’t need to be up and about. But most animals hide and rest --without sleeping, and mammals and birds too big to hide still have to lie down and sleep every day out in the open, exposed to every predator in the world. They do it as little as possible--a horse sleeps only three hours a day, of which only thirty minutes is spent lying down in REM sleep--but they would be better off if they didn’t have to do it at all.

Evidently, sleep isn't primarily an adaptation to our external environment. It’s something imposed upon us by the needs of the brain. If we’re forced to stay awake around the clock day after day, we start manifesting pathological symptoms culminating in hallucinations and metabolic collapse Molecular biologist Francis Crick, who has turned in recent years to the study of brain function, has suggested (along with his co-workers at the Salk Institute for Biological Studies) that birds and mammals can’t live without sleep because their behavior is flexible and learning based. This theory holds that behavioral flexibility-- free will, if you like--introduces noise into the system and tends to mess up the innate, "hard-wired" responses and behaviors that all animals need for survival. According to Crick’s model, sleep in general--and REM sleep in particular--acts every day to erase the neural irrelevancies, reset all the innate systems, and put everything back in working order, like running a disk-repair program and restarting a computer.

One piece of evidence in favor of this model is that we need less sleep, especially REM sleep, as we age. Most infant mammals, including human babies, spend 50 to 80 percent of the sleep cycle in REM sleep. As we reach adulthood, the world grows more familiar and our behavior gets more routinized, and REM sleep drops to about 20 percent of the total cycle. Perhaps it does so because there is less new learning to be cleaned up after.

Sleep seems to restore something that is damaged or depleted by things that go on in our brains when we are conscious. Frogs and other animals that are probably never conscious don't need sleep. Animals that we know are conscious (people) do need to sleep. So do the animals that we suspect may be conscious (mammals and birds). It seems reasonable to think that animals that need to sleep as we do will sometimes wake up as we do and experience their own presence in the world.

The evidence for animal consciousness is indirect. But so is the evidence for the big bang, neutrinos, or human evolution. Some of the savants who doubt that dogs feel pain when you kick them remind me a little of those creationists who reject the theory of evolution because they have never seen a fish turn into a chicken. I suspect that these savants are less concerned about understanding the universe than they are about resisting the temptations of anthropomorphism.

To most of us, anthropomorphism doesn't look all that dangerous. Our close animal relatives, after all, are anthropomorphic in the literal sense of the word, which means "human-shaped." They have organs like ours, placed in the same relative positions. And interestingly enough, they seem to recognize the same correspondences and homologies that we do. Just as we anthropomorphize dogs, horses, and other domestic animals, they return the favour by using their own social signals to greet, entreat, and threaten us-- each other--much as they would fellow members of their species. Scientists often regard this "assimilation tendency" in animals as some sort of mistake, as if the poor stupid beasts were confusing dogs, horses, and people.

Psychologist Nicholas Humphrey proposes that our ancestors evolved consciousness because it enabled them "to read the minds of others by reading their own--to picture, as if from the inside, what other members of their social group were thinking about and planning to do next." Humphrey argues that other animals have no use for such insights and therefore aren't conscious. But mind-reading skills would be useful for other social species-- and between species as well. A zebra that can tell when a lion is feeling hungry is less likely to get eaten. A dog or a man who can tell when a horse is furiously angry is less likely to get kicked in the head.

If consciousness allows us to read other minds--by analogy with our awareness of ourselves--then the assimilation tendency makes adaptive sense. If so, then scientists' dismissal of even the most realistic sorts of anthropomorphism ironically diminishes the value of their own consciousness. In this one respect the average horse may be more fully awake than are a lot of psychologists and philosophers.

* * *

Matt Cartmill is a professor of anatomy and anthropology at Duke University. His award-winning book, A VIEW TO A DEATH IN THE MORNING (1996), is about the history of hunting.

Source: **Animal Minds, Animal Dream**s by Matt Cartmill

NATURAL HISTORY, March 1998, pp. 16-21

Questions on Animal Minds

1. What is anthropomorphism? (You may have to look this up.)

2. Define 'Morgan's Canon'.

3. What is the Turing Test for consciousness?

4. Explain 'binding' and why it isn't an explanation for needing consciousness.

5. What seems to be the best explanation for why we need sleep? What two explanations for sleep were rejected?

6. Explain how the assimilation tendency promotes consciousness.

7. Yes or No ..... Do animals have consciousness? If so, which ones?