

Do Animals and People with Autism Have True Consciousness?

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Abstract

Some philosophers think animals are not conscious because they do not have language. I am autistic and I think in pictures. If the philosophers are correct, I would have to conclude that I am not conscious.

Language is used to narrate the visual images that form my thoughts. I think consciously with the part of the mind that most people would call the subconscious. I can see the decision-making process and I make decisions by consciously "clicking" on one of several different choices that appear as pictures.

The orienting response may be the beginning of consciousness, because it provides the animal with flexibility of behavior and it no longer has to rely on reflexes or hard wired instinctual behavior. When a deer hears a sound it freezes and orients. During orientation it makes a decision to either run away or continue grazing. Consciousness developed in the phylogenetically old parts of the brain so it is likely that even simple animals have a simple consciousness. Conscious thinking in mammals and birds enable flexible problem solving behavior in a novel environment. Mammals and birds are also socially conscious. Consciousness may be a matter of degree as brain complexity increases.

KeyWords: Autism, visual thinking, consciousness, categories.

ACCORDING TO SOME philosophers and scientists, animals are not fully conscious because they lack the ability to think in language. There is no internal language dialog in their brains. Budiansky (1998) has reviewed many studies regarding animal cognition and he thinks animals are not truly conscious because they do not have language. He recognizes the cognitive abilities of animals but he states "consciousness is quite another matter, though, for whether or not languages causes consciousness, language is so intimately tied to consciousness that the two seem inseparable" (Budiansky 1998, p193). According to Budiansky I would have to conclude that as an autistic person who does not think in language that I am not conscious. There are many

language based abstract concepts that I do not understand. To understand a concept I have to form a visual image in my imagination.

Now I would like to explain how I think visually. For example, when I think about what I have to do today, I see pictures in my imagination of going to the supermarket, and other activities. Language narrates the pictures and 'videotapes' that play in my imagination. When I design equipment for the livestock industry, I can test run it in full motion virtual reality in my mind. More on my visual methods of thinking are covered in *Thinking in Pictures* (GRANDIN 1995).

Visualizing equipment is easy because there are no language based concepts that cannot be visualized. Concrete things are easy to understand. Some philosophical writing is impossible for me to understand. Some of the words used in books about consciousness are so language based and abstract that I do not understand them. Words like "percept" and "mentalizing" make no sense to me. Even though I do not understand some language based concepts, I think I am truly conscious. I am a college professor and have designed equipment that is used by most of the large meat companies in the U.S. and Canada.

Concept Formation Without Language

Forming categories is the beginning of forming concepts. The ability to form categories occurs in both people and animals. I am now going to explain how it is possible to form concepts by thinking with pictures. When I was a child I had to learn the difference between cats and dogs. At first I categorized them by size. That no longer worked when the neighbors bought a Dachund. Visual thinking is very specific. There is no generalized concept of a dog. There are only pictures of specific dogs in my memory. To comprehend the dog concept I had to look at many different specific dog and cat pictures I had stored in my memory. I had to find a common feature that all dogs had and none of the cats had. All the dogs, regardless of size have the same type of nose. All cats have an auditory feature that none of the dogs have. They all meow. My thinking is sensory based and not language based. After I determined the visual feature that all the dogs had, I could now categorize cats from dogs. The cat and dog pictures in my memory could now be sorted into dog and cat categories.

Categories can also be formed visually for more abstract concepts such as good and bad. My family taught me about good and bad behavior in a very concrete manner. Breaking a window would be bad behavior for which I would be punished and helping with the housework or cleaning up my room was good behavior. As I acquired many life experiences I could catalogue the specific experiences into different categories. Good and bad are not abstract concepts. They are like pigeon holes in a post office where the pictures of good and bad events could be catalogued. The concepts of good and bad were only understood when I had many specific images of good and bad experiences to look at. Then I can look for common features which make good and bad fall into visually understandable categories. Bad behavior hurts other people or their property. Bad behavior such as teasing can also hurt another person's feelings. When kids teased me, I cried. When I think about these events I see pictures in my imagination like videos. The pictures can then be sorted.

I am able to form concepts and make generalizations with visual pictures. Animals are also able to do this. For example, a guide dog for the blind has to be able to recognize an intersection in a strange city. Guide dog trainers teach the dog to generalize intersections by training the dog on many different types of intersections. If the dog was trained only on intersections with traffic lights, it may not know what to do at an intersection with no lights. Low functioning non-verbal people with autism have the same problem with generalizing. If the nonverbal person with autism is taught only at home to not run across the street, he or she will obey the rule at home but not at grandma's house. To generalize the non-verbal person with autism has to be taught not to run across the street at many different places.

My visual thinking for forming concepts is more complex. I use visual thinking for understanding concepts that are more complex than road safety rules. To understand how different parts of the brain are connected, I think about how the structure of the brain circuits is like a big corporation. I have been in many large corporate offices so I have many pictures stored in my memory. Neural circuits between different specialized areas of the brain are like different departments in a corporation connected by phone and computer lines. When a brain is damaged, some of the communication lines between departments are cut. The Chief Executive of the brain is the frontal cortex and when the frontal cortex is damaged, the different brain departments no longer work together in a coordinated manner.

Do people who never learn language as a child have true consciousness? SCHALLER (1991) describes teaching American Sign Language to a Mexican farm worker of normal intelligence who was deaf since infancy. This person had no education as a child and worked as a migrant laborer. Like a person with autism, he learned nouns first and his thinking was totally concrete and visual. She then describes observing several deaf farm workers who had never learned ASL who communicated in elaborate pantomime. They acted out their experiences of being chased by the border patrol. They took turns acting out their stories in great detail.

After the farm worker learned ASL he still never fully understood why people went to church and what an illegal alien was. Understanding these things requires complex use of language. He visualized that the border patrol (green uniform man) chased him away from the land of plentiful food and good jobs back to his homeland of little food. He had no concept of unjust or just, he just wanted to figure out the rules and avoid the green men. He never really understood why the green man kept chasing him. He did not understand God but he understood that a green work permit card had great power to repel a green man and make him stop chasing him back to Mexico. He did not know why the card had its power. The fact that his work permit card was fake was beyond his comprehension. Is he conscious? I would say yes. This man had normal emotions, communicated with facial expressions, did a variety of jobs and understood that work such as picking apples, got him money that he could buy food with. When he was a child, he knew there was something important in the books the other children used in school but he had no understanding of what printed words were. When he finally acquired language he would use single words to summarize his life. The word "green" had great significance. The great forces in his life were green; there were green men, green cards and green cars with green men in them. Money and the crops he picked were also green. SCHALLER (1991) describes visiting a house where several other deaf farmer workers with no language lived. They had a special place for their collection of green cards and they treated them like "gold." They did not understand an

abstract concept such as God but they understood the power of their little pieces of cardboard which enabled them to stay in the land of more food.

Thinking with the Subconscious

I finally figured out that what FREUD called the unconscious is the part of the mind that people with autism and animals think with. If one thinks without language one has to have sensory based thinking. I think in pictures, a dog may think in smells. Animals recognize other animals and people by voice. Even specific vehicles can be recognized. Sensory based thinking is true thinking. BUDIANSKY (1998) provides an excellent review of animal thinking and cognition but he thinks that language is required for full consciousness. Research is making it very clear that animals think (GRIFFIN 2001). I hypothesize that in normal humans, language based thinking blocks access to more detailed sensory based thinking. Perhaps language blocks access to the subconscious. Research with patients with frontal temporal lobe dementia, a form of Alzheimer's disease, indicates that as the disease destroys the frontal cortex and the language areas of the brain, talents in art and music emerge (MILLER et al. 1998; MILLER/CUMMINGS/BOONE 2000). Many of these patients had no previous interest in art or music. To use my corporate office analogy, removing language provides access to the "art department" and the "music department" of the brain. The chief executive offices in the top office building are removed along with the legal department. This may also explain savant skills in autism. Savant talents are described in TREFFERT (1989) and HERMELIN (2001).

Research with normal people has shown that it is possible to gain privileged access to primary brain areas. Disabling the frontal cortex with a magnetic field will cause normal people to gain some savant skills in drawing (Fox 2002). Privileged access is explained further in (SNYDER/MITCHELL 1999).

I am able to use visual thinking in a more symbolic way to understand concepts in neuroscience. Brain scan research in autism has shown that autistics have direct access to the picture department in the brain. They excel at the hidden figures test. When they are put in a brain scanner while doing this test, only the visual part of the brain is activated (RING et al. 1999). In a normal person, many parts of the brain in addition to the visual area are activated. In my lectures, I often show two picture slides to symbolize- this research. The brain scan of the autistic person is like a bright little cabin in a snowy dark wilderness and the brain scan of a normal person is like a bunch of lamps in a lamp store. In the normal person, it is difficult to tell which brain area is activated specifically for the hidden figure test. The activity in the visual part of the brain is lost among all the other activated areas. Maybe this is why the normal person does more poorly on certain visual tasks. The other parts of the brain may interfere with visual perception.

My Own Experience Thinking with the Subconscious

Below I describe how I may be directly accessing what most people would call the subconscious. In the following description of how I avoided a car accident, I explain how I used thinking in pictures to make conscious decisions. This example illustrates a level of consciousness that may be in some ways similar to consciousness in higher mammals. The near-accident occurred in fairly light traffic on a sunny day while I was driving to the airport on Interstate Highway 2S.

Cruising along at 70 mph in the southbound lane, I suddenly saw a huge bull elk running full speed across the northbound lanes. I knew I had to react quickly to avoid hitting him. Instantly, three pictures appeared in my mind. Each picture represented the end result of an option available to me. The first pictures were of a car rear ending my car. I knew from experience that slamming on the brakes could cause this. The next picture was the elk smashing through my windshield. From my understanding of animal behavior, I knew that swerving or any sudden sideways movement of my car might cause the elk to stop or slow down. The third picture was the elk passing harmlessly in front of my car. In this picture I saw what would happen if I gently applied the brakes to slow down. These pictures were like the picture menus one can click on an Internet web page. They appeared in my mind one at a time, but all within one second. This was enough time for me to selectively compare the options and choose the slow down gradually picture. I immediately calculated the elk's trajectory and speed coming across the highway, and my speed and position in the southbound lane and began to slowly apply the brakes. This choice prevented me from being rear ended, or having the elk crash through my windshield. The conscious choice was a visual process without the use of internal verbal dialog.

At the moment I became aware of the elk crossing the northbound lane, I resisted the urge to make a panic response and slam on the brakes. In just seconds, I evaluated the three pictures in my mind. To use computer jargon, I conducted a basic cost-benefit analysis of the options. After running a quick video like simulation of the elk passing harmlessly in front of my car, I simply clicked a mental mouse on the "slowing down gradually" picture. I made a conscious choice from visual simulations played in my mind. In another mishap on the highway, my ability to make a conscious choice was overridden by sudden panic. I was driving along a section of straight level highway on an icy night when a sudden gust of wind caused the car to skid. In this situation, I did not have time to make a conscious decision. Conscious behavior can only occur when there is time to think, whereas instincts, reflexes and simple conditioned responses take over when there is no time to think. For example, a grazing animal suddenly being attacked or chased by a lion relies on instincts and reflexes. These behaviors may not be completely conscious. However, when an approaching predator is far away, an animal has time to decide on the best evasive action. When I hit the patch of ice, reflexes took over and I lost the ability to make an appropriate response. No option pictures appeared in my mind which could be used for making a decision. Reflexively, I began swearing uncontrollably and jerking the wheel in the wrong direction, as I was skidding off the highway. I had no time to recall what I had learned about steering into a skid. My car ended up on the median strip and fortunately, my vehicle and I were undamaged.

Some people question why I had three visual choices instead of just one. I think language covers up seeing the choices. This is due to my visual associative way of thinking. In everything I do, I see different choices as pictures on a computer monitor in my imagination, My thinking is not linear. I have learned by interviewing highly verbal thinkers that their thoughts are in language and they do not consciously see choices. Language may be another layer of thinking which covers up the visual pictures. I have no purely abstract thoughts. I only have pictures.

The "autistic type" of consciousness I used in both near accidents may be in some ways similar to conscious processes some animals use when they encounter danger. In both animals and people, conscious processes may have evolved as mechanisms for both avoiding danger and

finding food. In other words, consciousness evolved as a means of allowing higher mammals to perform intelligent, adaptive responses to challenges in their environment. Rather than always relying on reflexes, simple conditioned responses, or hard-wired instinctual behavior patterns, consciousness allows animals to make choices between several different options. Although consciousness is important, instinctive, reflexive and simple learned behaviors are also important. The instinctive killing bite to the throat used by most predators, the reflexive response of a horse kicking at a predator on its heels, or the conditioned response of learning to avoid places that are full of predators, all evolved as mechanisms used for survival and may not require consciousness. Even insects can learn a simple conditioned response. The questions of whether non-human animals have consciousness depends on what we mean by consciousness. Animals are probably conscious if you can agree that consciousness without language is possible.

Orienting Response is the Beginning of Consciousness

On Thursdays, the garbage truck picks up trash in the neighborhood next to where Mark stables his horses. The moment the backup alarm of the truck sounds, all the horses turn and orient towards the sound. Like soldiers at attention, all the horses aligned their eyes, ears, head and body in the same direction. The orienting response is accompanied by increased heart rate, respiration and blood pressure. When animals orient they switch from unconscious behavior to conscious. Both animals and people orient towards novel sounds. In the wild, animals orient and freeze when they hear or see something that might be dangerous. A deer that hears the rustling sound in the bushes instantly freezes and turns both its eyes and ears towards the sound. A deer will turn and face the noise before it flees. The orienting response provides time for the animal's brain to make a conscious decision instead of just acting on reflexes and instinct. During the orienting response, the deer can decide to either flee or continue grazing. When I avoided the elk on the highway, I had time to make a conscious choice. But, when I skidded on the ice, there was not enough time to make a conscious choice.

LIBET's research suggests that during the orienting phase the brain can consciously veto a response. In my own case, the first picture that popped into my imagination was the consequences of a panic response. The third and best response, which was the last picture to occur, required suppression of the reflex panic response. To put it in more philosophical terms, the brain does not allow free will but it definitely gives you powerful abilities to veto certain responses. To exercise the veto power, there must be time to look at different possible responses. Research by Benjamin LIBET at the University of California has shown that the brain takes longer to process conscious awareness of a stimulus compared to an unconscious reaction to it. Up to half a second is required for full conscious awareness to occur after a stimulus is applied to the brain (NORRETRANDERS 1991). If you touch a hot stove, an unconscious reflex controlled by your spinal cord has already pulled your hand away before you feel the pain. Conscious processing of incoming information takes more time than a simple response governed by a reflex. A zebra kicking at a lion is probably relying on reflexes, but a zebra that hears a far away sound which may signal danger has time to weigh his escape options.

Levels of Consciousness

Brains become more complex when the phylogenetic tree is ascended. The brain expands and more and more areas are interconnected. Consciousness becomes more complex. Being a visual thinker, I want to look at concrete things I understand such as comparing nervous system complexity between different species. I agree with William JAMES, the father of psychology, who stated in 1891, "consciousness grows more complex and intense the higher we rise in the animal kingdom" (JAMES 1891, p141). LEDOUX (1996) maintains that conscious occurred in the animal kingdom when the cortex expanded and it allows animals to relate several different things at once. Both DAWKINS (1993) and GRIFFIN (2001) agree that conscious behavior occurs when animals can adapt their behavior and solve problems under novel conditions. To be conscious requires flexible behavior.

I have to conclude that there are some higher language based conscious experiences that I do not have. There are books on philosophy that make no sense and the world of algebra is impossible for me to understand. A problem with discussing consciousness is that some of the discussion goes into abstract language based concepts I simply do not understand. To define consciousness one must first define the word 'conscious.' I prefer definitions based on nervous system complexity. I think it is wrong to say that the term consciousness only applies to humans with language. DAMASIO (1999) states that consciousness resides in the phylogenetically old part of the brain. When a person gets Alzheimer's, consciousness is one of the things they lose last. They are fully aware of losing their other abilities.

Visual thinking is also phylogenetically old. A recent review by COLLETT/COLLETT (2002) in Nature Review in Neuroscience, shows that insects use visual thinking to navigate. Very small brains can store visual information and compare an image that is observed with an image in memory. Do I think individual bees and ants are conscious? My answer is no. Electronic circuits can be made to mimic insect behavior. So as a person with autism, what is my definition of consciousness? For me, consciousness and being able to think are the same thing. Thinking is being able to solve problems in a novel situation through the use of previously learned information (GRIFFIN 2001; DAWKINS 1993). It is not reflexes, instinct or simple operant or classical conditioning. There is a vast scientific literature on animal cognition.

Consciousness Fragments in Abnormal Brains

Behavior becomes more complex in more complex brains. Damage to the frontal cortex in both animals and people reduces the flexibility and complexity of behavior (KOLB 1990; FREEMAN/WATTS 1950). Flexible behavior requires a brain that can associate information from many of its parts. Research in autism by Nancy MINSHEW and her colleagues at Carnegie Mellon University show that in autistic brain, the different parts of the brain are less interconnected (MINSHEW 2002, personal communication). Are they less conscious than a normal person? I will let the language-based philosophers decide.

Many people with autism, myself included, have problems with multitasking. Autistics also have difficulty hearing and seeing at the same time. Donna WILLIAMS, a verbal writer with autism, explains how her senses fragment (WILLIAMS 1988). She writes "It ongoing conscious awareness is a luxury that an overloaded nervous system cannot afford" (WILLIAMS 1998, p239). She has difficulty integrating her emotions and thoughts together. Emotions are

disconnected from thoughts. In my own career, I can play video in my mind of past events with little or no emotion. From my own experiences and from reading Donna WILLIAM'S writing, it has become obvious that all the different subsystems are not working together. To use my corporate office analogy, Nancy MINSHAW's research shows that the autistic brain would be like an office where both internal phone lines and lines to the outside world are malfunctioning. Communication between departments inside the office building are hindered and sensory circuits that would be analogous to phone lines from the outside world also malfunctioning. There are fewer phone lines and they are often overloaded and are full of static. It is my opinion that when Donna's sensory system overloads and malfunctions, she has impaired consciousness. Thinking consciously works fine for me, but my emotional consciousness is impaired because I do not fully integrate thought and emotion. A brain scan test showed that an area in my frontal cortex is missing a circuit to the amygdala. The amygdala is the brain's emotion center.

Compared to some animals, my emotional and social consciousness is impaired. I was over 50 years old when I learned that people communicate emotion with subtle eye movements. I read about them in a book entitled, *Mind Blindness* (BARON-COHEN 1995). GRIFFIN (2001) states that animals are able to convey some of their thoughts to other animals. Prairie dogs have a complex communication system of tones for communicating to other prairie dogs information about predators (SLOBODCHIKOFF 2002). They have specific tones and calls that they invent for warning of specific individual predators such as "It coyote that stalks", or "coyote that lies and waits". The calls convey both emotional urgency and a description of the predator.

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Lack of Sensory Integration and Consciousness

I think that the fragmented consciousness that a person with severe autism has may be similar to some lower animals. The lower one descends on the phylogenetic tree, the more difficulty an animal has with association across the senses of vision, hearing or touch. Maybe some animals are only conscious on one sense and it is all reflexes and instincts and simple learning in others.

Moving up the evolutionary ladder from insects, many biological scientists agree that mammals and birds have primary consciousness because they can process simultaneous stimuli and they have an internal representation of their experiences. Birds are capable of problem solving under novel conditions. Sverre SJOLANDER (1997) states that a snake may not be conscious because it does not have a centralized representation of its prey. It seems to live in a world where a mouse is many different things. SJOLANDER explains that striking the mouse is controlled by vision; following the mouse after striking is controlled by smell; and swallowing the mouse is controlled strictly by touch. There is no integration of information from all the senses. Each sensory channel operates independently of the others. When a snake has a mouse held in its coils, it may still search for the mouse as if "the information from its body which is holding the prey did not exist" (SJOLANDER 1997, p597). It appears that the snake has no ability to transfer information between sensory channels (STEIN/MEREDITH 1994; SJOLANDER 1995). SJOLANDER (1997) further explains that a snake has no ability to anticipate that a mouse running behind a

rock will re-appear. Cats and other predatory mammals are able to anticipate that the prey will reappear. According to SJOLANDER, snakes are not conscious. Using this definition of consciousness, then an autistic person experiencing severe sensory overload is also not conscious. Sensory overload causes them to lose the ability to integrate input from all the senses.

Lower animals such as reptiles and insects have great skills that resemble the skills of an autistic savant. The autistic savant can do great feats in art, music or mathematical computation but he is incapable of many ordinary everyday skills such as cooking or balancing a checkbook. Simple social interactions have to be learned by rote. Ants and bees have a great ability to store and use visual images (COLLINS/COLLINS 2002) but there is no evidence that they can do flexible problem solving. There are simply not enough association circuits in their simple nervous system.

Maybe there are levels of consciousness that can be correlated to how the nervous system is wired. Perhaps bees are visually conscious but have no other consciousness?

Conclusions

To have a sensible discussion on consciousness one must first define consciousness. Griffen (2001) also discusses the problem of defining consciousness. To me, consciousness implies flexibility of behavior under novel conditions. Maybe there are different levels of consciousness.

1. Consciousness within one sense. Example: ants using stored visual images to navigate. I would classify ants as not conscious unless they can solve a problem under novel conditions.
2. Consciousness of aversive stimuli that cause fear possibly in only one sense. I will speculate that fish operate at this level.
3. Consciousness where information from all the senses can be integrated with emotion and the emotions are more complex than just fear. I speculate that dogs and birds operate at this level.
4. Consciousness in people who have normal intellect but the emotions are not fully integrated due to missing connections between the frontal cortex and the limbic system. I put myself in this category. Some autistics will lose consciousness in one or more sensory channels.
5. Consciousness where all thinking is in language. The thing that is interesting is that I have observed from interviewing many people that people who think totally in language are poor in art. Their minds are language specialists. People who are good at art or engineering seem to have more specialized minds that are poor at social emotional consciousness but good at more specialized uses of the mind.

To conclude, maybe consciousness is like GARDNER'S (1983) different types of thinking. Consciousness may vary in both type and complexity. To have consciousness there probably has to be a certain minimum amount of circuits to associate information from different parts of the brain. Maybe there is fear consciousness, pain consciousness, visual consciousness, language abstract consciousness, smell consciousness and many other combinations and types of consciousness.

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