Consciousness Platform

The Greatest Mystery of All Time

BY SID DEUTSCH

This article is about the model for a very controversial edifice—the many-sided foundation for consciousness. What I refer to is, undoubtedly, the greatest mystery of all time—why do we have an awareness of our own existence? What is the evolutionary advantage of consciousness? Much of the material printed about consciousness has a religious flavor, with references to the human spirit and/or extrasensory perception, but I will have none of that here. In this study, consciousness is tied in with a platform, not a physical platform, of course, but a conceptual platform. This is because we are most comfortable imagining or visualizing an actual platform that has many connections to various parts of the brain, a sort of an old-fashioned telephone switchboard.

The dictionary defines consciousness as the state of having an awareness of one's own existence, sensations, and thoughts, and of one's environment. This is a great definition because it also hints at the biological basis for consciousness: sensations have to feed to the consciousness platform (CP). Similarly, thoughts form a very important part of the CP input. However, information about the environment is really another name for sensations.

Sensory Outputs

With regard to sensations, the body has many different types of sensory receptors: touch, auditory, taste, olfactory, and visual, as well as cold, warmth, pain, and visceral receptors (a catchall for vitally important internal receptors that are not readily apparent, many of which are members of the autonomic nervous system). In addition, sensors in the brain that maintain body temperature at 37 °C; sensors in the inner ears responsible for maintaining balance; chemosensors that try to make you breathe again when you upset oxygen and carbon dioxide levels by holding your breath; sensors for sex, hunger, thirst, urination, and defecation; and sensors that inform the brain about voluntary movements.

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How many of these sensory outputs reach the CP? Very few, for two good reasons. First, of course, is that you would be conscious of a huge amount of unnecessary data, most of which would act like noise to distract and confuse since, generally, we consciously concentrate on only one input at a time. Second, much of the data have to be processed before they get to the CP. An example taken from the visual system is shown in Figure 1.

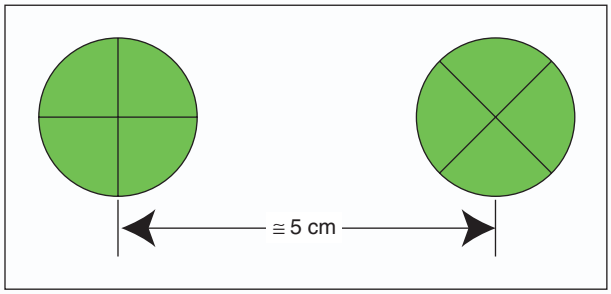

Fig. 1. Visual stimulus used to demonstrate the ''blocking out of reality.''

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Do other animals have an awareness of being?

This is an opportunity for you to prove to yourself that you can block out reality. Please stare at the two circles, but let your gaze look beyond, so that the two circles coincide. Almost immediately, you will lose the + or the ×, or bits and pieces of the + and ×. The reason is that there is a conflict between the left eye's + and the right eye's ×. (Note: Some people have difficulty seeing this optical illusion.) The blocking out has to occur somewhere along the optic nerve, after the retinas. It is an example of binocular rivalry. The retinal outputs do not go directly to the CP; they are first combined to give binocular vision. A similar convergence occurs for auditory signals originating from the left ear and right ear; they are first combined.

What about ''touch'' signals? The CP features a map of the body. With reasonable resolution (excellent for the lips and poor for the back), we are conscious of the location of pressure points.

The years have seen an accumulation of case histories of patients who have suffered brain damage because of disease, accidental injury, or tumors and associated surgical intervention. These histories show that the brain is compartmentalized. It is an electrochemical processor of signals, with compartment A feeding to compartment B, or perhaps to B in parallel with C. There seem to be between 50 and 100 compartments, depending on whom you ask. Only a few of them feed to the CP, for the reason given earlier: you would be conscious of a tremendous amount of distracting information. For example, we are not aware of heartbeats. Admittedly, the heart rate is an important piece of information, and a rate too low (below 60 beats/min) or too high (greater than 100 beats/min) may call for medical intervention. However, we have evolved from lower animals for whom beat rate is meaningless; if we had to do so, we could develop humans that are consciously aware of their heart rate.

Consciousness Issues

Before we get to your CP, it is a good strategy to review some issues that border on consciousness: There are two nervous system worlds: the voluntary and involuntary networks. Each sends information to the CP. Do other animals have an awareness of being? This question is important because it provides the evolutionary starting points for consciousness. Do these starting points include insects? Do they have an awareness of being? With regard to your consciousness, at what point in embryo development did you become conscious?

When we speak of the nervous system, we usually think of its glamorous components—those that are involved in the writing of books, music, equations, and so forth. These activities are controlled by the voluntary or somatic nervous system (somatic here pertains to the framework of the body). By contrast, there is also an involuntary, visceral, autonomic nervous system, which actually consists of two systems called the sympathetic and parasympathetic. [The viscera are the internal organs of the body, especially those contained within the abdominal (intestinal) and thoracic (chest) cavities. Autonomic refers to involuntary, spontaneous activity.] The autonomic nervous system is devoted to housekeeping chores that we cannot normally consciously control. Glands, smooth muscles, and the heart are innervated by this system. A typical example is provided by the heart's pacemaker, the internal mechanism that determines when the cardiac muscle should contract. The pacemaker is connected to both the sympathetic and parasympathetic systems. When the former is excited, it speeds up the pacemaker; when the parasympathetic fibers are excited, the pacemaker slows down. Each system is part of a feedback loop. Although the CP does not control the autonomic nervous system, it does know what is going on to a limited extent—we are consciously aware of emotional states such as fear and pleasure. This information is also stored in memory, of course.

Do other animals have an awareness of being? Because all mammalian brains are anatomically similar, the answer, unquestionably, is that all mammals have a consciousness. How about insects? Experiments with honey bees show that they are capable of a great deal of learning. The bees collect nectar and pollen; they land instinctively on objects that look like flowers. If the object rewards a bee with nectar or pollen, the bee will store five types of information related to that flower: odor, color, a low-resolution picture of the flower patterns, the approximate time of day, and direction and distance to the food. Bees have been taught to store information for as many as nine different flowers in one day. The following day the bee visits each flower, according to its ''appointment book,'' until a particular flower is no longer available. A human would find it very difficult to memorize all of these details.

Perhaps we can receive some guidance from past mysteries that have been solved. Consider that the human race has been ''cut down to size'' by these developments: the universe no longer revolves around the earth, the heart is merely a pump and can be replaced by an electromechanical surrogate if need be, and the deoxyribonucleic acid (DNA) molecule of a plant or a worm uses the same four nucleotide bases as does the DNA of a human. This recitation implies but does not of course prove that consciousness is so commonplace that insects also have an awareness of being. However, we have to be careful here: the CP integrates the signals from different compartments of the brain, and the insect brain certainly has different compartments. However, some living creatures are so primitive that their brain consists of a few cells settled in

At what point in the development of living organisms did consciousness begin?

various strategic locations throughout the body. These cells are autonomous to a great extent, with minimal signals sent to other autonomous locations. There can be no CP here, no awareness of being.

There are, of course, different levels of consciousness. When you are half asleep or have recently imbibed vodka and orange juice, your CP cannot function at full efficiency.

Lower animals have lower levels of consciousness, but one cannot make a blanket condemnation. The olfactory system of a dog's CP has a much higher level of consciousness than that of a human; the dog does not spend its time learning English, but instead, it knows the distinctive odor of every object it encounters.

At what point in the development of living organisms did consciousness begin? Animals move about from place to place in search of food, to escape from predators, find a mate, escape from a hostile environment, and so forth. Movement requires a nervous system, and the integration of movement requires a brain. The simplest of animals has sensory inputs and the equivalent of a hypothalamus-processing center and a motor center. One can conceive of a completely instinctive creature without sensory feature extraction and pattern memory stacks. Most environments are hostile, however, in that food is scarce and predators are plentiful; in that event, an animal that cannot learn and store memories is at a severe disadvantage. In a relatively short time after animals emerged, 570 million years ago, the rudimentary equivalent of pattern memory stacks and consciousness must have developed.

Requirements for Consciousness

At what point in embryonic development does consciousness begin? This could be the foundation of a serious discussion of the requirements for consciousness. In this brief essay, however, I can only touch upon a few highlights.

The embryo starts with simple materials: carbon, oxygen, nitrogen, hydrogen, and a sprinkling of sulfur, iron, and a few other elements. Properly assemble around one million of these atoms and we have one of the smallest of living creatures, a virus. With many more atoms and a much more complicated structure, we can get a robot. With yet another arrangement of atoms, we get a fertilized human egg. As directed by its DNA molecule, given the proper raw materials, amino acids and protein molecules are synthesized. The egg starts to grow by dividing repeatedly in two: 1, 2, 4, 8, 16, . . . cells. Eventually, a neural plate forms, cells proliferate in localized regions, the immature neurons migrate to their final residences, they aggregate and differentiate to form the various parts of the brain, and they mature and form connections with other neurons. Starting with almost nothing, with a few simple building blocks, a brain is thus created. Somewhere along the way, probably around birth when a certain minimum number of connections have been completed, the human embryo becomes aware that it exists. We will never know, for sure, unless somebody invents a consciousness meter.

You and Your CP

Finally, let us talk about you and your CP. They really are the same, for without the CP you do not exist except as a sleeping, unconscious body. How did it come about? Your mother gave birth to an infant whose CP developed to become you. Be grateful, then, that you did not develop into the CP of a dung beetle or that of a dinosaur. (Forgive me for deprecating dinosaurs, but the uncivilized behavior of some of our human elements and their incompetent friends is reminiscent of a dinosaur environment.)

You could have developed on some other planet not in the solar system. As a human, you are privileged to be living through a minuscule period in the 13.7-billion-year life of the universe. We can regret having missed the dinosaurs, but we are in a very exciting period, nevertheless. (However, there are plenty of humans whose lives are so miserable that they would like to surrender their CP.) If you can be an activist, try to harness your efforts for the benefit of the human race; if you are not an activist, relax and enjoy being conscious and watching the earth go by. Do not dwell too long on the idea that free will, in the CP, is an illusion. Minimize time spent sleeping; stay conscious as long as possible, for it will end soon enough, forever.

Sid Deutsch received his Ph.D. degree from the Polytechnic Institute of Brooklyn (now the Polytechnic Institute of New York University) in 1955. He is the author of Einstein's *Greatest Mistake: Abandonment of the Aether*, 2006. He is a Fellow of IEEE and the Society for Information Display. He served as an associate editor for *IEEE Transactions on Biomedical Engineering* from 1991 to 1996.

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